FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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- Mar. 29 .. **Ass. Football. R.A.F. *v.* R.N. at Millwall.**
- April 3 .. **" Operation of the Aero-Postale Service in Europe." Lecture by M. P. Grimault before R.Ae.S.**
- April 5 .. **N.F.S. Air Meeting, Reading.**
- April 5 .. **28 Sq. (R.A.F.) Old Boys' Assoc. Social at Slater's, High Holborn.**
- April 5 .. **Aircraft Club, Competition for Models, Harrogate.**
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- Sept. 20 .. **Liverpool Air Pageant.**
- Sept. 27 .. **N.F.S. Air Meeting, Hanworth.**
- Nov. 28-Dec. 14 **Paris Aero Show.**
- Dec. 31 .. **Closing date for the Aga Khan's Prize for Indian Flight.**

EDITORIAL COMMENT

FLYING, both service and civil, is uniquely fortunate in that it makes very little difference whether a Conservative or a Socialist Government is in power. In policy Lord Thomson and Sir Samuel Hoare are two men very like-minded. Each takes the long view. Consequently debates on the Air Estimates are not wrangles between opponents, but are more like committee meetings in which the ex-Secretary for Air makes helpful suggestions to his successor. It was in that tone that Sir Samuel Hoare, following Mr. Montague in the House of Commons last week, made one of the most masterly speeches of his career.

Aircraft and Empire Defence

A Ministry of Defence has been suggested many times. It has a specious attraction for most of us, and it may come to pass some day. But it has never been popular with the politicians. The practical difficulties seem to be too great. Sir Samuel Hoare carefully refrained from renewing the suggestion, but he did suggest a sort of temporary alternative to a Ministry of Defence. He asked for two things. The first was a concrete request for an impartial enquiry into our policy of Empire defence with a view to seeing if the Royal Air Force could not relieve the Navy and the Army of some of their police duties. The second suggestion was more general and rather more vague: namely that Whitehall methods should be simplified so that the Air Minister might act quickly when air action was necessary. Probably the second request will be the more difficult to grant.

Sir Samuel Hoare, tactfully and reasonably, based his plea for extended use of air power upon economy. The case of Iraq stands out. The savings effected there by entrusting the defence of the country to the Royal Air Force have been enormous. It is reasonable to suggest that similar large savings might be made elsewhere.

Next, Sir Samuel Hoare proceeded to argue that curtailing the responsibilities of the Navy and Army would lead to a saving on our general defence budget

without impairing the efficiency of the services so grievously as the present method of saving is apt to do. He spoke feelingly, and doubtless from bitter experience, of the Treasury's rough and ready demands for a cut of 5 per cent. or 10 per cent. by one or another service, of the long ensuing wrangle between the various departments, and of the final definite injury done to one of the services by stinting it of money which it ought to have. It was a moving picture, and it carried the conviction that the present method is wrong. It would certainly be better for, say, the Army to let the Air Force do more work for it than to leave the Army inefficient in some important respect.

Then Sir Samuel Hoare gave some particular instances in which the Air Force might relieve the other services; but here he was getting a little outside his personal experiences. Some of his suggestions sound very good: others not quite so good. One suggestion which seems excellent is for an extended use of flying-boats for coast defence. Presumably, the term "coast defence" need not be taken in too restricted a sense. The policing of any narrow seas might come under that heading; and one's thoughts turn at once to the Persian Gulf. With a certain backing of Naval and Royal Indian Marine vessels, seaplanes ought to be able to protect British interests in those waters. Some years ago the Government of India was troubled by an epidemic of gun-running in Arab dhows across the Gulf. It was a profitable business to get rifles through that way to the Pathan tribes on the North-West Frontier of India. For a year or two a considerable force of small R.N. and R.I.M. vessels was kept busy hunting for dhows and examining their cargoes. There was no glory in the work, and the sailors hated the terribly trying climate of the Gulf. Seaplanes could have done the work far more efficiently; and the airmen would have got into a cool atmosphere every time they flew. Then India once had to land a military force on the Mekran coast of the Gulf. On another occasion, when Persia was in a state of chaos, the Central India Horse was sent there to protect British interests. In both cases the soldiers were faced with great difficulties, and there is little doubt that seaplanes (had they then existed) would have been more effectual as well as far cheaper. There are various other places where seaplanes would also be the best police.

Of airships, Sir Samuel Hoare said that he would speak more cautiously, but he believed that they could undertake at least some of the long-distance reconnaissance work now done by cruisers. This suggestion has been made more than once by Sir Dennistoun Burney, who knows something about the Navy. Sir Dennistoun's latest ideas about commercial airships do not apply to naval airships, where the question of pay-load does not matter. If airships prove to be airworthy, which is now hardly in doubt, they must certainly be cheaper than cruisers for patrolling the ocean trade routes. Nor is their vulnerability to tracer bullets a drawback, provided that the Navy can forbid the open seas to enemy aircraft carriers. The *Emden* would have had a very short career if airships could have swept the Indian Ocean in 1914. This is a line of enquiry which must certainly be explored in the not distant future, and it offers chances of very large economies in the construction and maintenance of cruisers.

It was when he came to deal with specific military problems such as the defence of the North West Frontier of India that we do not feel certain that we can go all the way with Sir Samuel Hoare. To claim too much for aircraft is one of the dangers of the day, and Sir Samuel admitted that he had been accused of having been bitten by a mad aeroplane. He said in his speech "I have never been able to believe in the possibility of an invader penetrating the passes of the mountains which divide Afghanistan and India if there was a strong Air Force on the Indian Frontier." He also stated that the Air Force had frequently operated with success in that region, despite the mountains. He added that the Army in India would be free to proceed with such matters as mechanization if it were partially relieved of the responsibility for guarding the Frontier.

The North West Frontier of India is a different problem from the Sudan, Iraq, Aden, etc. In savage warfare no enemy aircraft will be met, and so the task of the Royal Air Force is simplified. But there will be no serious invasion of India from the North West unless the invader is Russia. A Soviet army would bring its own aircraft with it, and that would alter the whole situation. It would be too much to assume that the Royal Air Force alone could master the Soviet flying corps and also render the passes impassable, by night as well as by day, to the Soviet army. The co-operation of the Army in India would be imperative Mountain warfare is not like other warfare: it is a thing apart. Every soldier who has served on the North West Frontier knows that a raw battalion, like Kipling's "Fore and Aft," is useless until it has studied and practised this specialised form of fighting for a considerable time. A British private or a plainsman sepoy cannot at first even climb the hills, much less fight over them. The necessity to keep a well-trained force of infantry, cavalry, and mountain batteries on the Frontier can never be removed by any supply of tanks or aeroplanes. We might add that, despite past successes, it is not right to send single-engined aeroplanes to work over those hills where there is practically no chance of landing without a bad crash. So long as there are no enemy aircraft in the offing, a special type of mountain aircraft ought to be evolved and used.

Still, the Indian Frontier is a special case, and one case does not invalidate a general argument. Even on that Frontier, aircraft have proved increasingly useful. In very many parts of the Empire Sir Samuel's arguments hold without qualification. In Australia, for instance, we recently argued that the Royal Australian Air Force should be regarded as more important than the Australian Army or the Royal Australian Navy. Where the possible opponents are not civilized the advantages of using air action are most pronounced. Air action has been proved to be both humanitarian and cheap, and its use should be extended wherever possible. The suggestion of a committee of enquiry is excellent.

NEW ZEALAND

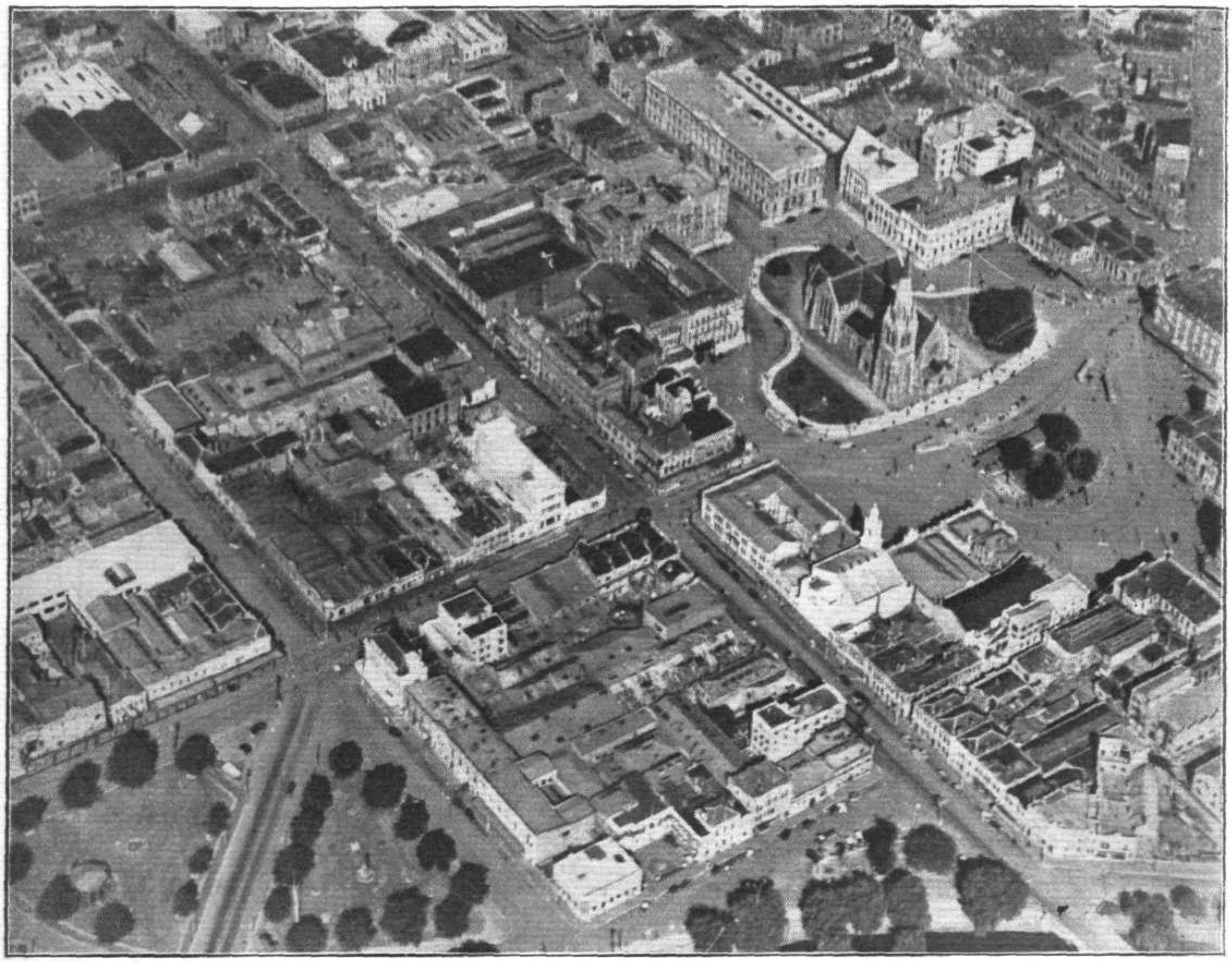
NEW ZEALAND, in common with South Africa, is a Dominion which has not yet aspired to the institution of a "Royal" Air Force, that is to say, a separate air fighting service. The air force is still an arm of the army, and the Director of Air Services is under the military authorities. Still, within the last few months, New Zealand has taken two steps which mark an advance in the direction of increasing the status and dignity of its air force. Last autumn, a Liaison Office was established at the Air Ministry, London, and Maj. T. M. Wilkes, M.C., was appointed Liaison Officer. In January, it was decided that the personnel should adopt air force titles of rank instead of military titles, and Maj. Wilkes accordingly became Sqdn.-Ldr. Wilkes.

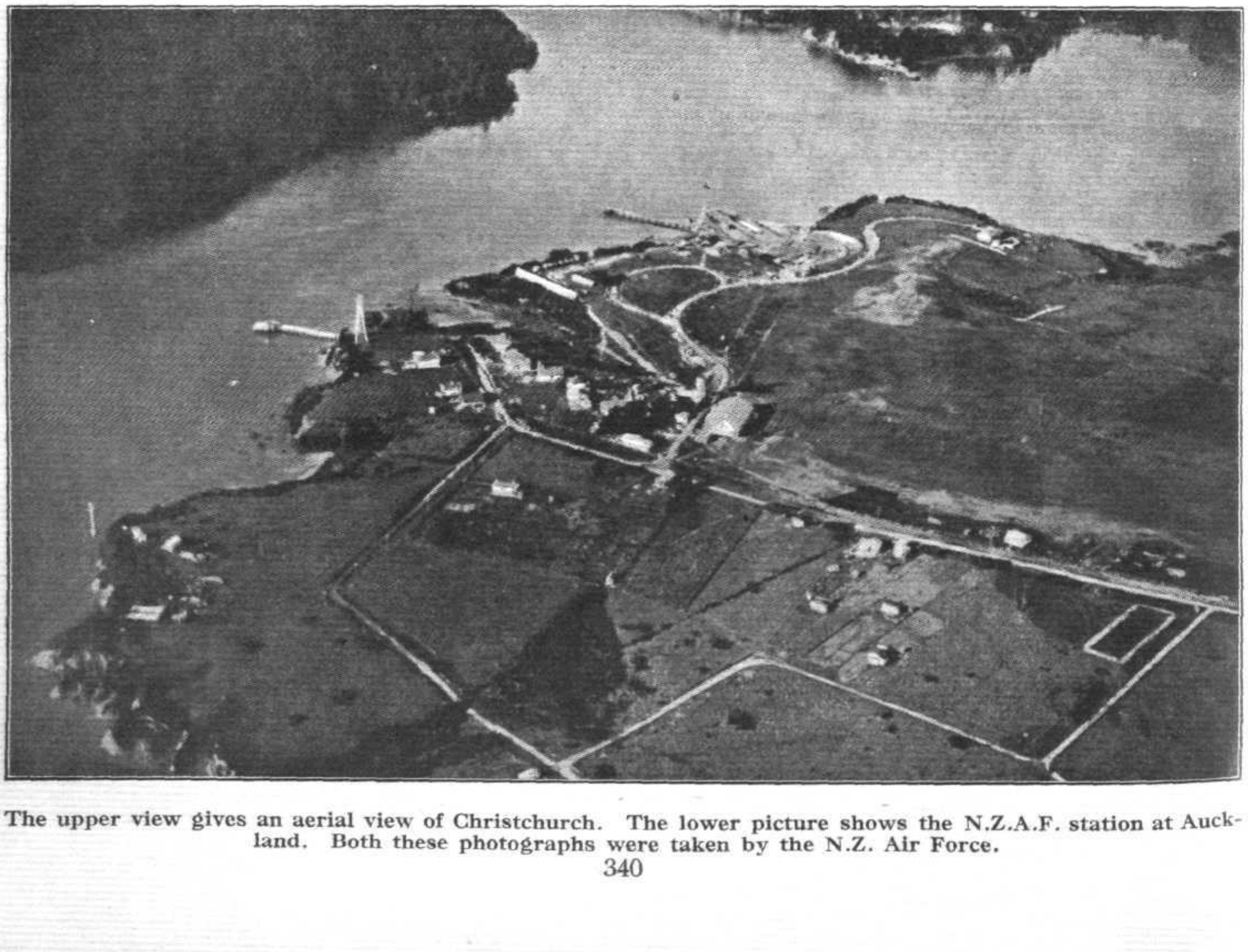
These two steps are very much in the right direction, but it would seem that the time is as yet hardly ripe for New Zealand to set up a third fighting service. The Dominion Navy is carried on a separate vote, the vessels and most of the personnel being supplied by the Admiralty, but being paid for by the Dominion. The Army is paid for by the Defence vote, and last year the aviation section of this vote amounted to £60,397, of which £53,097 went for military flying, and £7,300 on civil flying.

There are two classes in the New Zealand Air Force, the Permanent Air Force and the Territorial Air Force. The former forms a nucleus of eight officers and 17 other ranks, while the Territorial force has a strength of some 100 officers and 20 other ranks. A number of aircraft apprentices has recently been engaged, and the degree to which the applications outnumbered the vacancies was a gratifying evidence of the spirit of young New Zealanders.

There are two New Zealand Air Force stations, one in the North Island at Auckland, and one on the South Island at Wigram, near Christchurch. The station at Auckland is for both seaplanes and landplanes; that at Wigram is only a

The upper illustration shows the newly-opened Municipal Aerodrome of Wellington, situated at Rongotai, Lyall Bay. It forms a half crescent along the shore. The dark area in the photograph is already grassed. The light portion is crushed rock or sand, which has yet to be covered with refuse from the city destructor, top-dressed, and turfed. The lower picture illustrates a visit of the Auckland Aero Club to Wellington recently, during a tour which the club made of the North Island. Reading from left to right, the names are:— R. J. Copley (ground engineer of the A.A.C.), I. C. Horton, Hon. Mr. T. M. Wilford (then Minister of Defence, now High Commissioner in London), Major G. A. C. Cowper (Instructor, A.A.C.), Capt. W. S. R. Bloomfield, R. Claire and K. R. Hackett (both of "N.Z. Herald")





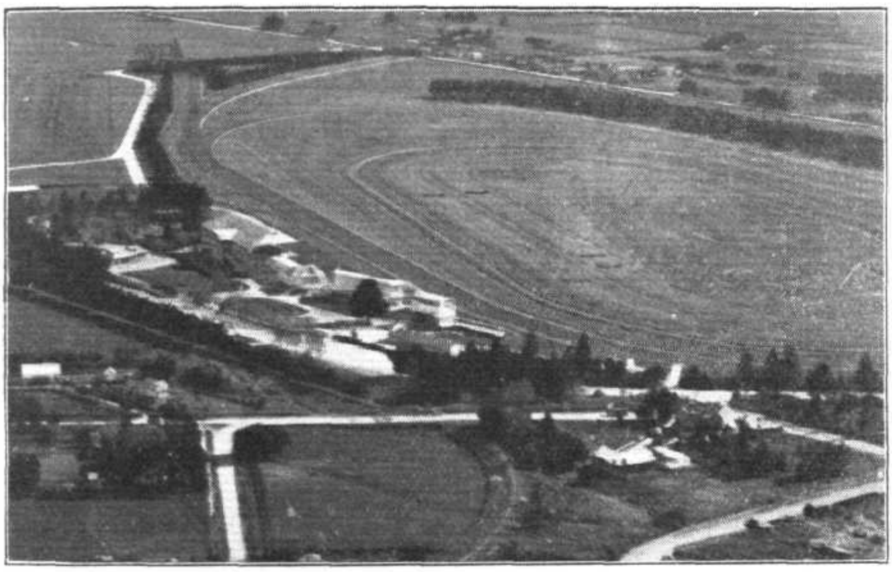
The upper view gives an aerial view of Christchurch. The lower picture shows the N.Z.A.F. station at Auckland. Both these photographs were taken by the N.Z. Air Force.

land aerodrome. The equipment of the two stations, according to latest advices, is as follows. At Auckland there are two Fairey 3 F seaplanes and 1 "Moth," with alternative land and sea undercarriages. During the recent unrest in Samoa, the "Moth" was sent to the Mandated Territory on H.M.S. *Dunedin*, with Flight-Lieut. S. Wallingford as pilot, and 50 hours' flying was carried out over the disturbed tracts. The "Moth" carried a short-wave wireless apparatus on these flights. It is not certain whether the machine still remains in Samoa or has returned to Auckland.

At Wigram there are four "Moths," four "Avros," five "Bristol Fighters," three "Grebes," two D.H.4's, one D.H.9, and one D.H. 50. The aerodrome is situated five miles from Christchurch, near the banks of the Waimakariri River, and is about 100 acres in extent. It lies on the edge of the great Canterbury plains, the largest plain in New Zealand, and therefore excellent flying country. Refresher courses in flying for citizen officers were carried out at Wigram last January. Great enthusiasm was displayed, and the standard of flying was good.

Civil flying has made a good start in New Zealand, though much of the country is mountainous and unsuitable for any but experienced pilots to fly across. The city of Wellington has recently opened a municipal aerodrome at Rongotai, by Lyall Bay. One of our illustrations shows a group of members of the Auckland Aero Club on the occasion of a visit to the new aerodrome. Altogether, there are 19 light aeroplane clubs in the Dominion, of which three receive subsidies from the Government. At the end of 1928 there were only three private light aeroplanes in the Dominion. A year later there were 25 private and club machines. In 1928, only one serious accident occurred, and consequently flying has earned a high reputation as a safe as well as an enjoyable occupation. Considering the size and population of the country, and remembering also that the movement is of comparatively late growth in New Zealand, the number of the clubs is most gratifying evidence of the spirit which prevails.

An aerial view of Wigram Aerodrome, the N.Z.A.F. station outside Christchurch in the South Island. This aerodrome is being extended and improved.



Riccarton racecourse, near Christchurch, as seen from the air. Both these photographs were taken by the N.Z. Air Force

NEW ZEALAND PILOTS' FINE FLIGHT

FLYING Officers H. L. Piper and C. E. Kay, two New Zealanders, who set out from Croydon on February 19 in a Desoutter Cabin Monoplane ("Cirrus Hermes") to fly to Australia, landed at Port Darwin on March 23, after the first flight "carried out in comfort from England to Australia."

The Desoutter machine has emerged with flying colours from its first big trial. It is the first light cabin aeroplane to fly to Australia, and it undoubtedly provided its pilots with a far more comfortable trip than any machine which has made the journey hitherto. On arrival at Port Darwin, Mr. Piper cabled to the Desoutter Aircraft Co., Ltd., "Aircraft wonderful under all conditions." It was one of the standard production machines, taken from stock, and only modified by the addition of an extra petrol tank and the streamlining of certain exposed fittings.

When Piper and Kay started from Croydon, the machine was loaded to 2,000 lb. total weight, as against the normal loading of 1,800 lb. Even with this extra weight on board, a cruising speed of 102 m.p.h. was obtained with the machine, and both the pilots stated that it was as pleasant to fly as any aircraft within their experience. It should be mentioned that they had only spent a few hours in getting accustomed to the machine before starting off on the Australian flight.

As regards the "Cirrus-Hermes" engine with which the machine was fitted, no more need be said than that it has lived up to the splendid traditions of its famous predecessor, the "Cirrus," and the makers received a cable from the airmen expressing their entire satisfaction regarding the performance of the engine. Practically every great flight in the history of light aeroplanes has been performed with an engine of Cirrus make.

It appears that the delay at Akyab was caused through some slight trouble with the oiling system.

The preparation of maps, route information and ground organisation for the flight was entrusted by Messrs. Piper and Kay to the Service Department of National Flying Services, Ltd., who are the sole concessionnaires for the Desoutter machine in Great Britain.

After their first delay at Jask, all went well across India until they reached Akyab—here the trouble previously referred to delayed them about a fortnight, but once they got going again they made good progress to Port Darwin. They intend to fly on to Sydney, and then proceed by steamer to New Zealand.

Although they failed to beat Bert Hinkler's record of $15\frac{1}{2}$ days, they have nevertheless put up a fine performance.

THE MOORE 3-VALVE ENGINE

A New American Air-Cooled Radial in Two Models

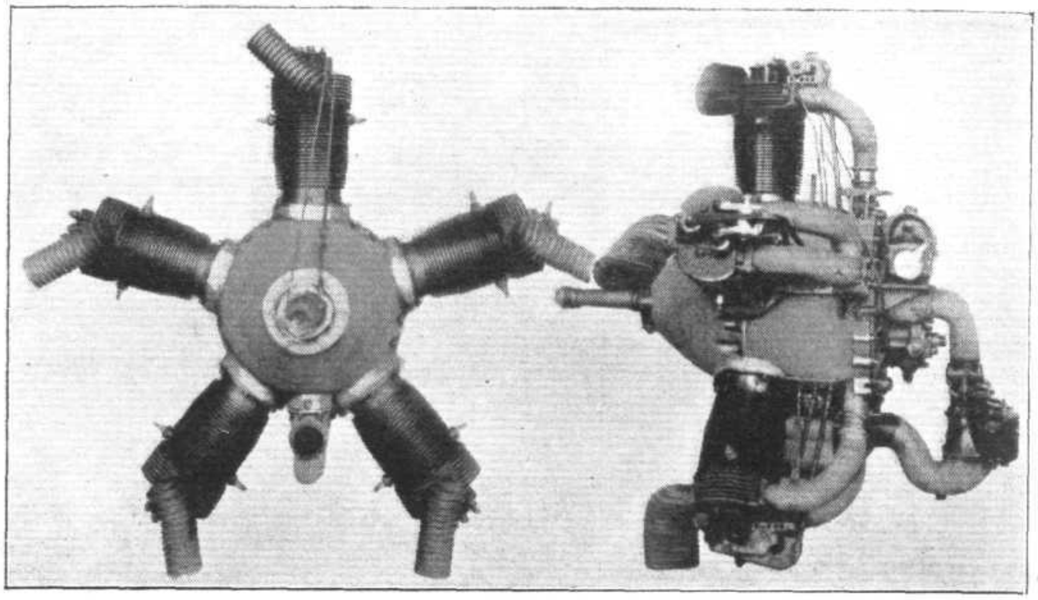
GENERAL AIRMOTORS COMPANY, of Scranton, Pennsylvania, have recently developed an air-cooled radial aero engine, designed by R. S. Moore, and known as the " Moore 3-Valve " engine. We give on this page some illustrations of this engine, together with a power curve and some brief particulars.

Two models are produced, a five- and seven-cylinder, both of the conventional radial oil-cooled type, but possessing several special features. The 5-cyl. model is shown in the illustrations. The company hold the Department of Commerce Certificate No. 36, with a rating of 120 h.p. at 1,600 r.p.m.

One of the special features of this engine is the valve arrangement, viz., two intakes and one exhaust valve per cylinder actuated by single intake and single exhaust push rods, incorporating a unique yoke design on the intake rocker arms. A two-way intake pipe is employed and found very effective, permitting exceptionally low barrel and head temperatures.

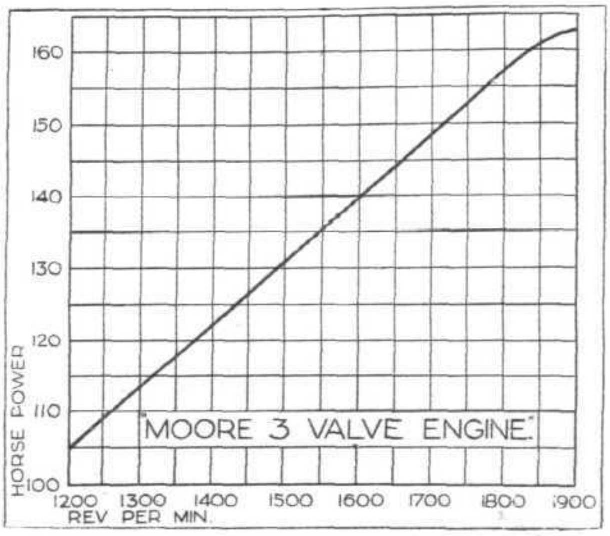
A special method has been devised for clamping the aluminium head to the steel cylinder. The cylinder and head form a poultice arrangement, explosion takes place in the steel cylinder. This method prevents the blowing of heads and maintains a permanent set in the cylinder due to a closed end, consequently the cylinder will not go out of round, and the oil consumption therefore is reduced to a minimum.

Slipper-type aluminium alloy pistons are used. Split crankshaft with standard S.A.E. 20 spline for 1930 design. The master rod is solid with full floating bearings. All parts are made of standard specifications.



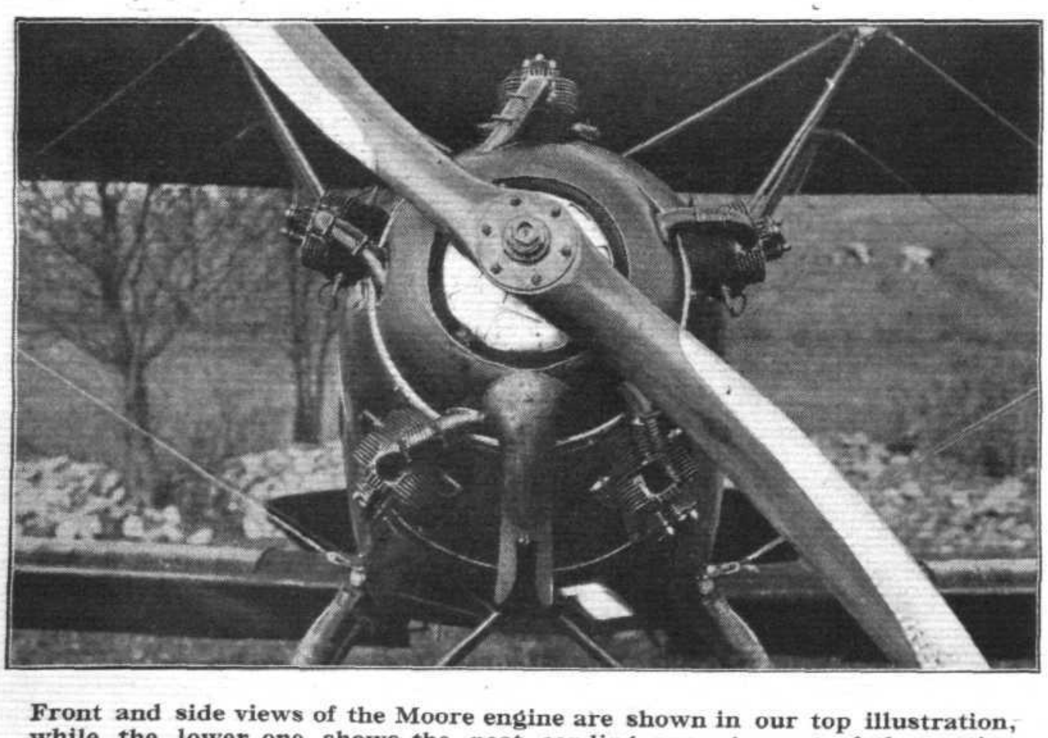
5-Cylinder Model

Bore ..	5 *in.*
Stroke ..	5½ *in.*
Compression ratio	5·6
Displacement	540 *cu. in.*
Dry weight	380 *lbs.*
H.P./Displ.	0·33 *per cu. in.*
Horse power	180 *at* 1,900 *r.p.m.*
Weight/H.P.	2·11 *lbs.*
Petrol consumption	0·5 *lb./b.h.p.*
Oil ,,	0·015 *lb./b.h.p.*



7-Cylinder Model

Bore ..	5 *in.*
Stroke ..	5½ *in.*
Compression ratio	5·6
Displacement ..	756 *cu. in.*
Dry weight	430 *lbs.*
H.P./displ.	0·33 *cu. in.*
Horse power	250 *at* 1,900 *r.p.m.*
Weight/H.P.	1·6 lbs.
Petrol consumption	5 *lb./b.h.p.*
Oil ,,	0·05/*b.h.p.*



Front and side views of the Moore engine are shown in our top illustration, while the lower one shows the neat cowling arrangement of the engine actually fitted in a machine.

PRIVATE FLYING AND CLUB NEWS

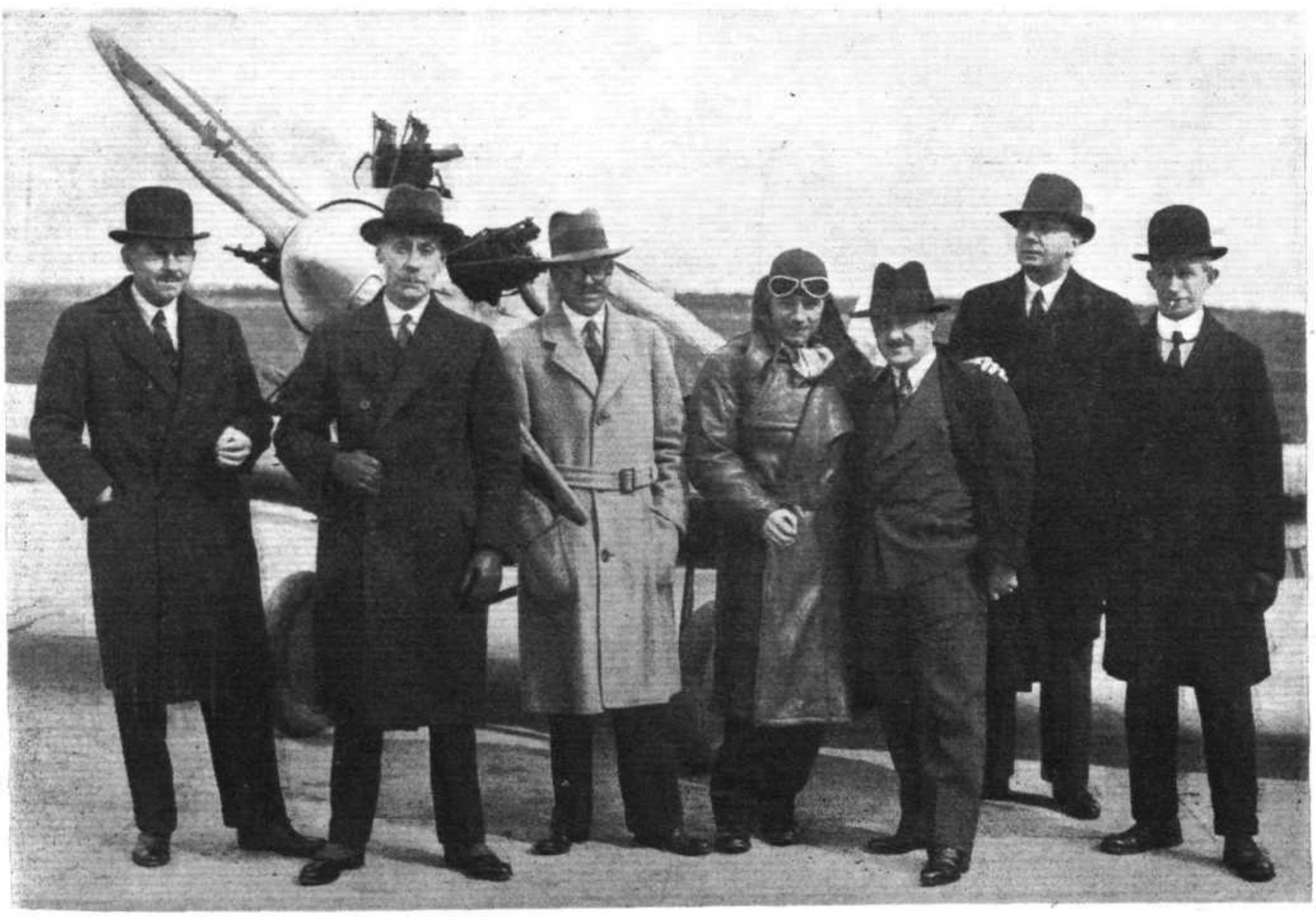
THE LONDON AEROPLANE CLUB announce that the winning ticket in the raffle for the Gipsy-Moth was No. 1026, held by Lieut. Craig, of Westways, Totland Bay. Last Saturday, March 22, saw a terrific burst of activity at the club and a record total of 29 hr. 15 min. was flown, while three members qualified for their "A" licences.

THE, BERKS, BUCKS, AND OXON AERO CLUB are really out to give everyone a good show with their pageant, on Saturday, April 5. With N.F.S. behind them, their resources are naturally great and the "circus" led by Capt. H. M. Schofield will, of course, be one of the chief attractions. Miss Spooner is expected to be one of the entrants for a race for which the club are giving a cup, and the autogiro will probably gyrate, incidentally, one of the latest models has recently been seen flying a lot at Hanworth, where many of the pilots have been amusing themselves landing this "like a parachute." The pageant will be preceded on the Friday evening by a ball at the Town Hall, tickets for which are obtainable from Miss L. Cribb, 12, Highmoor Road, Caversham, or from Capt. A. Pennington, Reading Aerodrome, Woodley, Berks. Judging by their last dance this will be an event well worth going to and the B.B. & O. Club are to be congratulated on their enterprise in every direction. Seldom has a club made such headway as this has done and more seldom still has a club weathered all the difficulties which were the lot of the founders in the days gone by. Now, however, we hope they are so firmly established that there will be no looking back and their enterprise will be a model for all the future provincial centres of N.F.S.

MR. G. ALLEN, of Nella's Toffee Co., Ltd., St. John's Hill, Wareham, Dorset, is desirous of getting into touch with all those who are interested in gliding and who reside in Wareham, Bournemouth, and the surrounding district with a view to forming a gliding club. We wish them luck and trust that the club will be formed shortly as the sport is growing in popularity rapidly and procrastination can do nothing but harm to those who are keen.

BRISTOL AIRPORT will be opened officially by H.R.H. Prince George, on May 31, and an International Air Pageant will be held on the same day. The Bristol and Wessex Club have moved to the new aerodrome at Whitchurch, so that by the time of the official opening they will be already firmly established in their new home.

THE LIVERPOOL AND DISTRICT AERO CLUB will be holding an "At Home," to celebrate the opening of their new Club House, on Saturday, April 5. This is an unfortunate clash with the Reading Pageant, but we hope that they will have a good attendance of members from other clubs, any of whom will be made very welcome, whether they arrive by air or by more mundane means of travel.



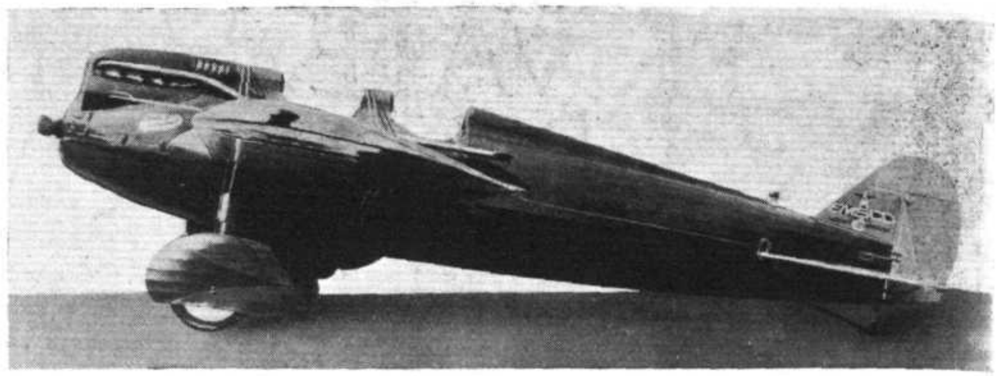
A DISTINGUISHED VISITOR : A group taken at Heston recently on the occasion of a visit of Dr. Klemm in connection with the proposed formation of a company to manufacture Klemm aeroplanes in this country. Left to right: Major Stephens, C. Best, Dr. Klemm, F. Kirsch, P. Turner, H. Barlow, G. Newman. (FLIGHT *Photo.*)

There will be an "arrival" competition open to all visiting pilots. The winner will be the pilot of the machine which flies from south to north across an imaginary line on the aerodrome, through the landing circle, at right angles to the River Mersey, nearest to 2 p.m.

An error of up to 1 min. will be allowed each pilot for each 50 miles flown from a starting point to Hooton, with the

exception of the first 50 miles. A minimum distance of 30 miles must be flown.

Pilots must fly directly to Hooton and must not linger in the vicinity of the aerodrome nor make an intermediate landing without declaring it. This will be followed by a landing competition, open to all visiting pilots. The competitor will climb to at least 1,000 ft., and will carry out any evolution of his own choice—such evolution not to finish below 1,000 ft. On completion of same, the throttle will be closed and the pilot will endeavour to touch down within the landing circle and come o rest in the shortest distance.



THE EMSCO-CIRRUS : One of the many American machines now fitted with the American Cirrus engine. This machine has a top speed of 135 m.p.h. with a landing speed of 38 m.p.h.

Marks will be awarded as follows :—

(1) Maximum 5 marks for the evolution (more marks will be awarded for a simple evolution well carried out than for a more difficult one badly executed).

(2) Ten marks will be awarded the pilot who comes to rest in the shortest distance, measured from the centre of the circle. The pilot achieving the second shortest run will receive 8 marks, and so on.

(3) Competitors failing to make first contact with the ground within the circle will be disqualified.

THE CINQUE PORTS FLYING CLUB Committee have decided that ground members joining during the year ending March 31, 1931, will not be charged any entrance fee, though the subscription will remain at two guineas. Flying members will still pay one guinea entrance fee and three guineas subscription, and private owner associate members, one guinea subscription without any entrance fee. Monthly members can be enrolled at one guinea for 28 days. Canterbury is supplying many flying members to the club, Mr. Goulden recently passed the test for his " A " licence and Lieut.-Commdrs. Goble and Gubbins and three officers from the Guards' Depot have been taught by the club, while Dr. Whitehead Reid, who taught himself to fly during the war, and now keeps a Westland Widgeon II, has his own aerodrome at Bekesbourne. Last Sunday, March 23, Mr. Thorne, the new test pilot for A.D.C's., flew down with a friend, both in Hermes-Avians. Many well-known pilots have been heard to say that this machine is the nearest thing to a single-seat fighter they have ever flown and all are almost extravagant in their praise for the way it handles

THE DERBY AND DISTRICT AERO CLUB seem to have thoroughly awoken an interest in flying in their district by a preliminary meeting which they held with the help of many private owners, many of the staff of D.H.'s., Lieut. Bentley, of Shell-Mex, and Mr. Ivor McClure, of the A.A., on Sunday, March 9. The Club have, as yet, no machines of their own, but the keenness shown by the number of people who turned up should help to put them on a firm foundation before long. We wish them every success as the more clubs we have the better it will be for everyone.

THE LEICESTER AERO CLUB is going " full out " to make the meeting on the Saturday before Easter a memorable one, and with the help of the R.A.F. and the experience they gained last year there should be every chance of their doing so. A campaign has now been started in the district to make the rising generation air-minded by introducing Model Aeroplane Clubs into all the schools, and where they have previously made model yachts in their handicraft classes they will now make model aeroplanes. This is undoubtedly the right way to work, and we hope that those responsible will carry on with the idea and teach other towns the benefit that is to be gained from such a move.

THE NORFOLK AND NORWICH AERO CLUB were singularly fortunate in having both Lord Thomson and Sir Sefton Brancker at their second annual dinner held at the Maid's Head Hotel, Norwich, on Friday, March 14. Capt. A. A. Rice, the Chairman of the Club, presided. There was a very large attendance, and the speeches were by no means the usual dry-as-dust type which so many after-dinner speakers think it is their duty to give tongue to. Space does not allow even a summary of those speeches, but the consensus of opinion show that the dinner was one of the successes of the Club. The Lord Mayor urged the Secretary of State for Air to push along a municiapl aerodrome for them, as they—Norwich—did not wish to be behind as an

THE PANDER-GIPSY : A Dutch private owner's machine, which, fitted with the D.H. Gipsy engine, has a top speed of 125 m.p.h. and a landing speed of 50 m.p.h. This machine is fitted with Bendix wheel brakes as standard.

THE BREDA-CIRRUS SEAPLANE: The Breda 15 is another of many machines fitted with the Cirrus engine. It is very fully equipped and agencies are now being appointed in this country.

airport. One cannot help thinking that the Lord Mayor would have done better to have instigated matters himself, so that when Norwich was really in need of help they would then be able to say to Lord Thomson: "See what we have done, are we not worthy of help?" Lord Thomson has persistently advocated payment for results as the ruling policy for all such matters, and no one could be more eager to do all in his power for such undertakings when they have proved their worth.

GLIDING, as a result of the Congress recently held at Darmstadt, is to have an "International Commission for Studies in Motorless Flight." The Rhön-Rossitten Ges. in Frankfurt is entrusted with the preliminary work and the Royal Aeronautical Society has consented to co-operate.

BLACKPOOL may shortly have a local flying club. Negotiations are now in progress with the Lancashire School of Aviation, the Lancashire Aero Club and National Flying Services.

THE MIDLAND GLIDING CLUB have been presented with a glider constructed by Mr. Rushton, who also gave a very instructive lecture on the aerodynamics of gliding to the members recently.

NEWCASTLE may shortly have its glider club. Cramlington Aircraft, Ltd., have built a glider to the designs of Mr. Alec Bell and several successful flights have been made upon it by many pilots from the district, amongst whom were Miss Leatheart and Mr. Leslie Runciman, both of Cramlington Aircraft.

THE AIRCRAFT CLUB, HARROGATE, has been successful in securing the co-operation of a friendly farmer for the use of a site for the trials of its glider, which is fast nearing completion.

A NEW GIPSY ENGINE successfully passed the Air Ministry type trials at first attempt recently.

Following the success during the past twelve months of the 85-100 h.p. Gipsy engine, fitted into Moths and nine other types of light aircraft in Great Britain and elsewhere, the D.H. Co. has now produced an engine on the same lines, but developing 115-120 h.p., known as the "Gipsy Two." The extra power is obtained mainly by means of employing a longer stroke, and other refinements, which include an all-enclosed overhead valve gear running in oil; remarkable silence in operation is thus achieved.

Some days ago this new Gipsy successfully passed its Air Ministry type trials at the first attempt. These trials are extremely stringent. It may, therefore, be of interest to detail the procedure at these trials. The trial starts with a 50-hours endurance test running throughout at 9/10th throttle opening. This test includes 20 hours on the Heenan and Froude dynamometer brake, followed by 20 hours on a special test bed on which the engine drives a propeller, followed in turn by a further 10 hours on the brake. Slow-running and acceleration tests come next, again on the brake. After this, high-speed and high-power tests are observed on the brake, during which the engine must run at full throttle for one hour. During the course of these tests throttle and power curves are plotted. The engine is then stripped and minutely examined to see that it has suffered no detrimental effects from treatment which is more severe than anything likely to be encountered in the course of normal use.

MR. S. F. LILLYWHITE is another enthusiast who would be very glad to hear from those in his district who are keen to form a glider club. His address is 42, Sompting Road, Broadwater, Worthing. So will anyone interested please write to him direct.

THE BREDA-GIPSY LANDPLANE: A very low stalling speed of below 30 m.p.h. is claimed for this version of the Breda, together with a top speed of 105 m.p.h. when fitted with the Gipsy engine. (FLIGHT *Photo*.)

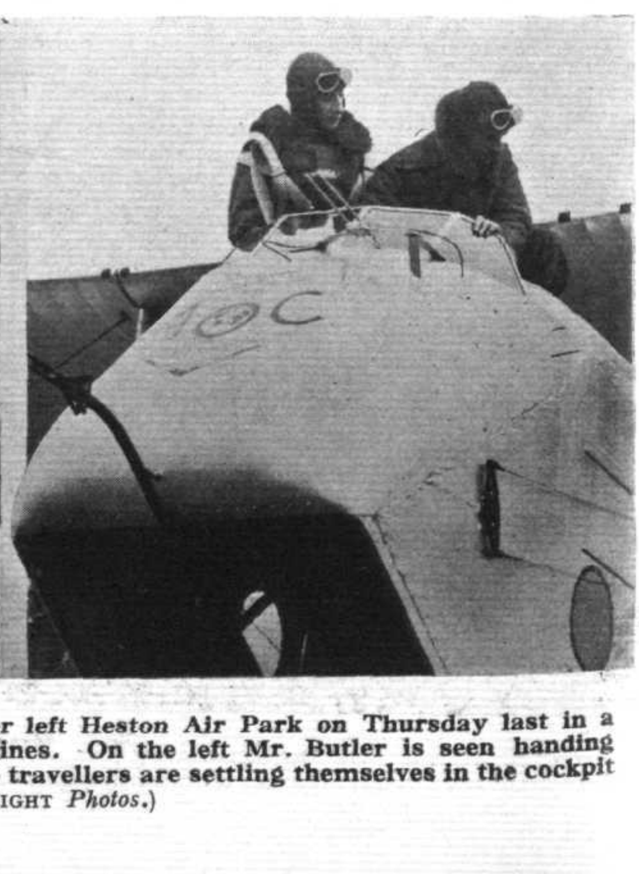
THE NORTHERN RHODESIA SURVEY

Start of the Machine

IN bright sun and a biting wind, a small party assembled at Heston Air Park at 11 a.m. on Thursday, March 20, to see the start of the Northern Rhodesia survey expedition of the Aircraft Operating Company for Africa. Rudyard Kipling once wrote " Farewell Romance—and all unseen Romance brought up the nine fifteen." But surely there is no more striking union of romantic adventure with modern science than in the making of maps and roads. Man then sets out to tame the jungle and the bush, and the more modern the means which he uses for his purpose, the greater is the romantic element. As one watched the special survey aeroplane standing docilely under the petrol pump for its tanks to be filled, one could not but picture it soon flying over the unexplored bush of Central Africa and revealing its secrets.

Maj. Cochran-Patrick, D.S.O., M.C., and the rest of the expedition are going out to the advanced base of the company at Buluwayo by the older means of travel. The " Gloster " survey machine is being delivered to them by air, and the two pilots who are flying it out are Mr. and Mrs. A. S. Butler, who are accompanied by one engineer, Mr. Millyard. The special equipment of the machine has gone with the main party, and for the trip it only carried what will be or may be wanted *en route*. There was a set of spares on board, including one propeller, and a Russell parachute for each member of the crew. Provisions, Primus stove, personal luggage, a gun, etc., did not make a very formidable pile, and it was not a long business to store them all on board. Nevertheless, an hour passed before the engines were started up, and during that time the searching wind went through the warmest coats and chilled all the spectators. Only Mr. Nigel Norman seemed indifferent to it, and he did not wear an overcoat at all. The port "Jupiter" certainly felt the chill, and for a considerable time refused to yield to the blandishments of the gas starter. At last everything was ready and the two engines were warmed up. Mr. and Mrs. Butler donned their Sidcot suits and said good-bye to their friends. The lightly-loaded machine seemed to take off with almost no run at all, and soon it was lost to sight in the air.

The machine is going out by easy stages. The objective for the first flight was Cologne. Other stops were to be made at Vienna, Belgrade, and Salonika. From Athens a direct flight across the Mediterranean was to be made to Sollum. From Cairo the regular African air route would be followed. Mr. and Mrs. Butler will not stop at Buluwayo, but will fly straight on to Capetown and there hand over the machine to Maj. Patrick's party, who will fly it back to Buluwayo. The Butlers will then take ship for Rio de Janeiro, for Mr. Butler intends to inspect the progress of the survey of that city which the A.O.C. is now carrying out. In the meantime this flight will have given him a personal knowledge of Africa, in which it seems certain that air surveying has only commenced its civilising work. Truly, air surveyors lead an intensely interesting life.



OFF TO RHODESIA: Mr. A. S. Butler and Mrs. Butler left Heston Air Park on Thursday last in a " Gloster " Survey Machine with Bristol " Jupiter " engines. On the left Mr. Butler is seen handing a Russell Lobe parachute to his wife. On the right, the two travellers are settling themselves in the cockpit just before the start (FLIGHT *Photos.*)

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

March 28, 1930

CONTENTS

THE INFLUENCE OF SIZE ON THE STRUCTURAL WEIGHTS OF AIRCRAFT.

By F. Duncanson, B.Sc., Wh.Ex.

(*In the issues of* The Aircraft Engineer, *of March* 28 *and June* 27, 1929, *Mr. Duncanson, who is on the technical staff of the Gloster Aircraft Co., Ltd., dealt with the subject of cantilever wings and outlined a method of estimating the amount of material necessary to resist bending moments and shear forces, as well as (in the last-mentioned article) torsion. In the present issue Mr. Duncanson has now turned his attention to the subject of influence of size on structure weight. In view of the large machines built last year, and more particularly the Do. X, this is a subject which cannot fail to appeal to all who are interested in aircraft design. The old "feud" between those who believe that a limit in useful size is very quickly reached, and those who hold that size enables the designer to effect weight savings in many details, thus increasing the size to which it pays to go, is still unsettled, Mr. Duncanson's article is bound to raise controversy, and doubtless he will find many supporters as well as a certain number of opponents. For the sake of simplicity mainly, and not necessarily because he would, if he were designing a large machine, use this form of construction, Mr. Duncanson has chosen the cantilever monoplane, this being rather more readily calculated. And the conclusions drawn should apply with but minor differences, to other forms of construction.* —Ed.)

Introduction

There are many advantages to be obtained by increasing the size of aircraft. Two of the most interesting are :—

(*a*) In the case of naval and civil flying-boats, an increase of seaworthiness as the size of the aircraft is increased.

(*b*) In all civil aircraft, a distinct improvement in passengers' comfort as size becomes greater.

Many other advantages, and perhaps some disadvantages, could be mentioned, and it is hoped that these may be brought up in discussion by readers of this article.

The object of this article is to obtain—by means of, as far as possible, logical assumptions and simple integrations—some idea of how structural weights are affected by the size of aircraft.

The cantilever monoplane type will be considered in the following investigation. The wing structure is susceptible of very simple mathematical treatment, and this type also gives many opportunities for improvements as size is increased, such as, for instance, the utilisation of the interior of the wing for the accommodation of passengers, freight, etc.

The methods outlined in the articles published in The Aircraft Engineer of March 28 and June 27, 1929, in which formulæ for the ideal spar weights and torque structure weights of cantilever wings were obtained, will be employed in the following investigation.

It is possible to obtain the ideal structural weights of the rest of the aircraft structure by similar methods, and this has been done for the case of an aircraft of normal proportions and designed to the load factors set out in Air Publication 970.

It has been found that the weight of the rest of the structure, *i.e.*, fuselage, tail unit, chassis and controls, in the case of a cantilever monoplane having a central load of 4,000 lb., is of the order of twice the weight of the wing itself.

The Fundamental Laws

The fundamental laws governing the structural weights of aircraft wings, of similar geometric proportions, are :—

The structural weight is :—

1. Directly proportional to the density/strength ratio, $\frac{\rho}{f}$ of the material employed.

2. Directly proportional to the load factor N.

3. Proportional to the cube of the linear dimensions. Examination of the expressions for structural weights given in the previous articles will show that the results may all be reduced to the above dimensions.

It must be clearly understood that the above laws hold good only if the structures considered are *geometrically similar*, in *detail design* as well as in *general layout*.

Thus it is seen that, for a constant wing loading and assuming for the moment that the load factor is constant, the total weight of the aircraft varies as the linear dimension squared, while the structural weight varies as the linear dimension cubed.

Structural weights then will be proportional to $W^{\frac{3}{2}}$.

If the load factor be allowed to vary, as is usual, on a descending scale with increase of size, then the structural weights will be proportional to $NW^{\frac{3}{2}}$.

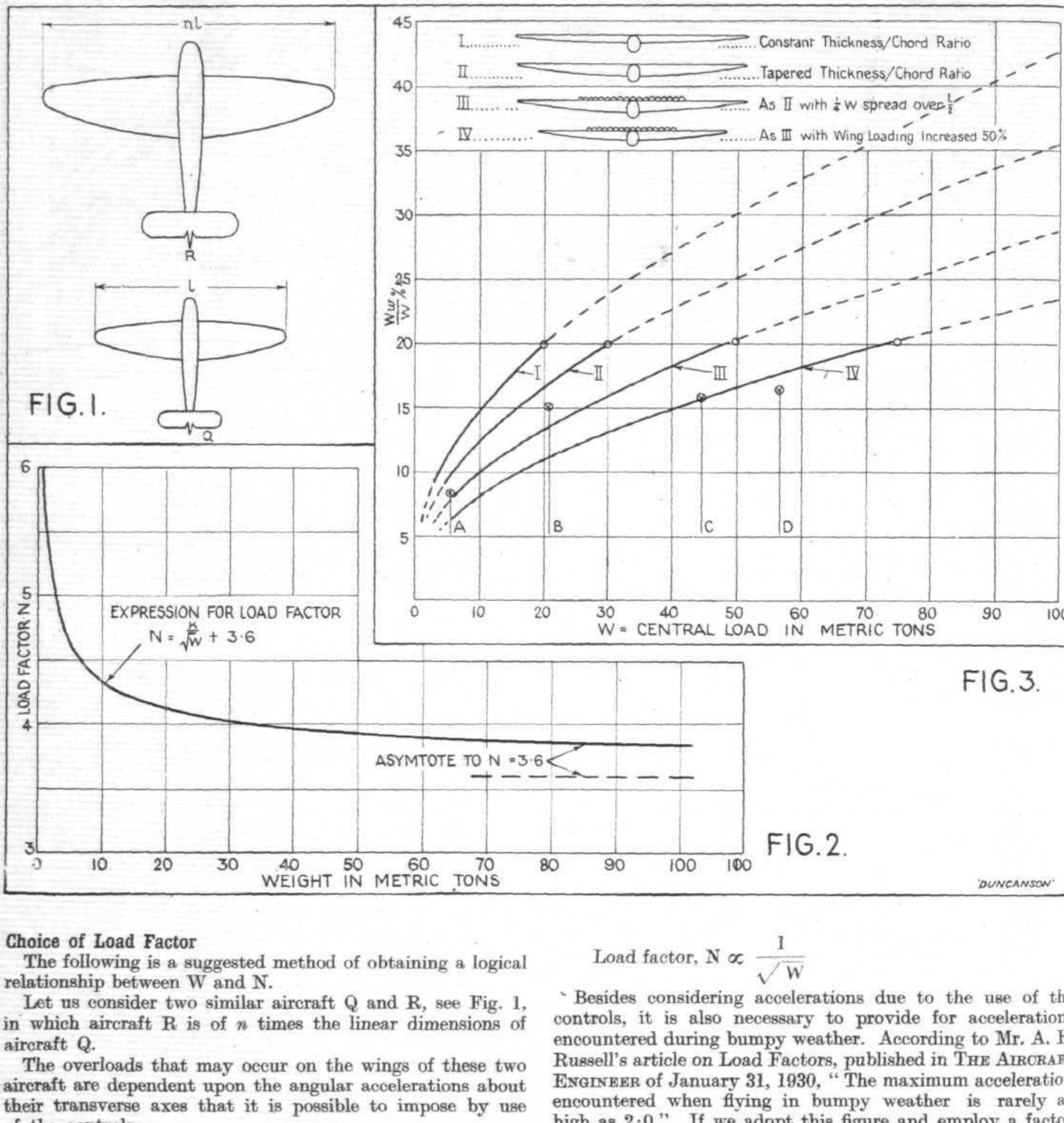


FIG. 1.

FIG. 2.

FIG. 3.

Choice of Load Factor

The following is a suggested method of obtaining a logical relationship between W and N.

Let us consider two similar aircraft Q and R, see Fig. 1, in which aircraft R is of n times the linear dimensions of aircraft Q.

The overloads that may occur on the wings of these two aircraft are dependent upon the angular accelerations about their transverse axes that it is possible to impose by use of the controls.

Let $\dot{\omega}_q$, $\dot{\omega}_r$ represent the angular accelerations of Q and R attained in normal use.

Then the ratio between the angular accelerations is :—

$$\frac{\dot{\omega}_q}{\dot{\omega}_r} = \frac{m_q}{\mathrm{I}_q} \cdot \frac{\mathrm{I}_r}{m_r},$$

where m_q, m_r are the turning moments imposed by the tails, and I_q, I_r are the moments of inertia of the two aircraft. Now it can be taken that m_q and m_r are proportional to the cubes of the linear dimensions of the aircraft, while I_q and I_r are proportional to the fourth powers of the linear dimensions. Hence

$$\frac{\dot{\omega}_q}{\dot{\omega}_q} = \frac{l^3}{l^4} \cdot \frac{n^4 l^4}{n^3 l^3} = n,$$

that is, aircraft R may only have $\frac{1}{n}$th of the acceleration of aircraft Q.

As the weight of aircraft R is n^3 times the weight of aircraft Q, we see that the accelerations of the aircraft are inversely proportional to the square roots of their weights, so that,

$$\text{Load factor, N} \propto \frac{1}{\sqrt{W}}$$

Besides considering accelerations due to the use of the controls, it is also necessary to provide for accelerations encountered during bumpy weather. According to Mr. A. E. Russell's article on Load Factors, published in THE AIRCRAFT ENGINEER of January 31, 1930, " The maximum acceleration encountered when flying in bumpy weather is rarely as high as 2·0." If we adopt this figure and employ a factor of safety of 1·8 we have a minimum load factor of 3·6 for the case of very large aircraft where the load factor given by adopting $\frac{1}{\sqrt{W}}$ as the criterion would begin to disappear.

The general formula for load factor is then of the form :—

$$N = \frac{K}{\sqrt{W}} + 3 \cdot 6$$

where K is a suitable constant. An appropriate value of K, if one considers commercial aircraft, may be found by assuming that the load factor should be 4 in the case of a machine carrying a central load of about 34 metric tons.

Then

$$K = \sqrt{34}\,(4 - 3 \cdot 6) = 2 \cdot 34$$

and the expression for load factor becomes :—

$$N = \frac{2 \cdot 34}{\sqrt{W}} + 3 \cdot 6$$

The resulting curve is shown plotted on Fig. 2.

The above method of expressing the variation of load

factor with central load is admittedly somewhat empirical. It is interesting to note, however, that at certain points the curve is very close to the C.P. forward load factors for aircraft in the normal category given in Air Publication 970, and that it is of a similar nature to the curve obtained by plotting the German load factor requirements, given by the expression,

$$n = \left(2 + \frac{2}{w+2}\right) \times \text{factor of safety of } 1 \cdot 8,$$

or

$$N = \frac{3 \cdot 6}{w+2} + 3 \cdot 6, \ w \text{ being in metric tons.*}$$

Expression for the Wing Structural Weight

In the following investigation we will consider the application of the theory to cantilever monoplanes of $6\frac{2}{3}$ aspect ratio and with a wing loading, based on the central load, of 12 lb. per sq. ft. The actual wing loading will depend upon the size of the aircraft, since the proportion of wing weight to total weight must necessarily increase with increase of size, so that we shall not, strictly speaking, base our results on the assumption of equal landing speeds.

The variation of landing speed will, however, be confined to reasonably narrow limits as the actual loading will vary from about 12·9 lb. per sq. ft. in the case of small machines to about 14 lb. per sq. ft. for the largest machine considered. The increase of landing speed in the case of the larger machines will therefore be only of the order of about 4 per cent.

From the previous investigations it was found that the ideal weights of the main spar and torque member could be expressed by the formulæ :—

$$\text{Spar weight} = 2\rho L\left[\frac{3}{14\,c.f} + \frac{9}{70\,fs}\right] l^3$$

$$\text{Torque member weight} = \frac{54}{25}\,\frac{\rho L q}{\theta G c^2}\, l^3$$

where ρ = density of material, L = loading per unit area $= \frac{NW}{A}$, l = semi-span, c = ratio of spar depth to wing chord, f = maximum direct stress, f_s = maximum shear stress.

In the case of the torque member, L, q and θ were given values such that the angular twist of the wing was limited to 1° at normal load at top speed.

It will be more convenient if the term $L\,l^3$ be transformed into an equivalent expression involving N and W. For the assumed aspect ratio and wing loading we find :—

Since

$$L = \frac{NW}{A},\ l = \sqrt{\frac{5A}{3}} \text{ and } A = \frac{W}{12},$$

$$Ll^3 = \frac{12NW}{W}\left(\sqrt{\frac{5\,W}{3 \times 12}}\right)^3$$

$$= 0 \cdot 623\ NW^{\frac{3}{2}}$$

Substituting this for Ll^3 in the above expressions, using steel of 65 tons per sq. in. proof stress, making $C = 0 \cdot 125$ and expressing weights in metric tons, we find :—

$$\text{Spar weight} = 0 \cdot 00263\ NW^{\frac{3}{2}}$$

$$\text{Torque member weight} = 0 \cdot 00252\ NW^{\frac{3}{2}}$$

Similar integration methods have been applied to find expressions for the weights of the ribs, aileron structure and covering, the summation of which give the value :—

$$\text{Weight of ribs, etc.} = 0 \cdot 0024\ NW^{\frac{3}{2}}$$

Summing up these quantities we have the ideal weight expressed by :—

$$W_w = 0 \cdot 00755\ NW^{\frac{3}{2}}$$

In practice it will be found impossible to achieve as low a weight as is indicated by the above expression, on account of the difficulty of developing the full strength of the material in compression and we must now multiply by an empirical constant which depends upon the efficiency of the design methods employed.

Quoting from Mr. H. J. Stieger's article, "Cantilever Wings for Modern Aircraft," published in AIRCRAFT ENGINEERING of August, 1929, "it should be possible to produce a spar such that the ideal is of the order of 70 per cent. of the actual weight." Adopting this figure, our expression for the actual wing weight will be :—

$$W_w = 0 \cdot 0108\ NW^{\frac{3}{2}}$$

The value of W_w as a percentage of the central load, W is shown by curve I on Fig. 3.

If we specify that the limit of usefulness of a wing is reached when it has a structural weight of 20 per cent. of the central load, it is seen that this limit occurs when the central load is approximately 20 tons, corresponding to a total aircraft weight of about 24 tons.

Effect of Changes in Geometric Proportions and General Design

The wing structural weight may be reduced by increasing the ratio of spar depth to chord towards the root of the wing. Another method of reducing the wing weight is to distribute part of the load over the inner portions of the wings instead of having the central load concentrated at the fuselage.

Let us first consider a wing having its main spar tapering in depth from 20 per cent. of the chord at the wing root to about 10 per cent. in the neighbourhood of the wing tip, instead of the spar previously considered, whose depth was $12\frac{1}{2}$ per cent. of the chord all along the wing. The two spar depths are shown plotted against semi-span on Fig. 4 for the purpose of comparison.

A convenient expression for the new spar depth is found to be :—

$$D = 0 \cdot 08 l^{\frac{1}{3}} x^{\frac{2}{3}}.$$

One could, of course, obtain an advantage by assuming that the aerodynamic twist diminishes the intensity of loading towards the wing tips, but for the sake of simplicity in the calculations, the original assumption of uniform intensity of loading will be retained.*

By substituting $D = 0 \cdot 08\, l^{\frac{1}{3}} x^{\frac{2}{3}}$ for $D = 0 \cdot 125 k x^{\frac{1}{3}}$ in the integration for flange weight, it is found that the flange weight is reduced to 0·705 of its previous value. The weight of the web will not be affected. A similar substitution in the calculation for the torque member shows that the weight is reduced to 0·783 of its previous value.

We may now re-evaluate the constants in the general expression for wing weight.

		Previous Constants.		New Constants.
Spar weight	flanges	0·00239	× 0·705	0·001683
	web ..	0·00024	× 1·0	0·000240
Torque member weight		0·00252	× 0·783	0·001972
Weight of ribs, etc. ..		0·0024	× 1·0	0·002400
				0·006295

So that the constant for the actual wing weight will be : $\frac{0 \cdot 006295}{0 \cdot 7} = 0 \cdot 009$, as compared with 0·0108 for the previous wing design, a reduction of 16·67 per cent. in weight.

The new value of W_w as a percentage of the central load is shown by curve II on Fig. 3.

It is seen that the limit of usefulness of a wing with these new geometric proportions is found to occur at a central load of 30 tons, a 50 per cent. improvement over the result previously obtained.

We will now investigate the effect of spreading part of the central load along the inner portion of the wing.

A reasonable proportion, say 0·25, of the central load may be taken to be more or less uniformly spread over the middle half of the wing. On each half of the span we then have an upward air loading, as before, equal to $\frac{W}{2}$, opposed by a

* From Mr. W. S. Farren's paper, "Monoplane or Biplane," read before the Royal Aeronautical Society, January, 1929.

* Incidentally, this assumption tends to cancel out the effect of the increased bending due to the fact that the wing weight per unit area is not constant, but increases towards the wing root.

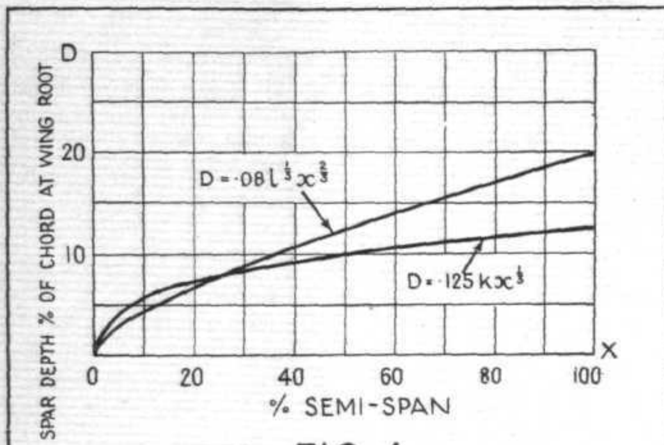


FIG. 4.

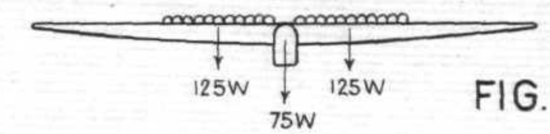


FIG. 5.

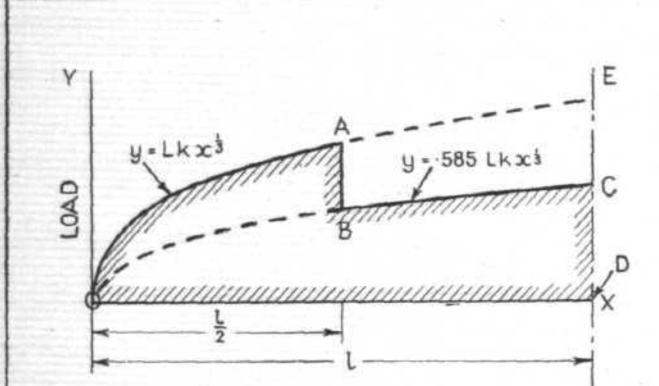
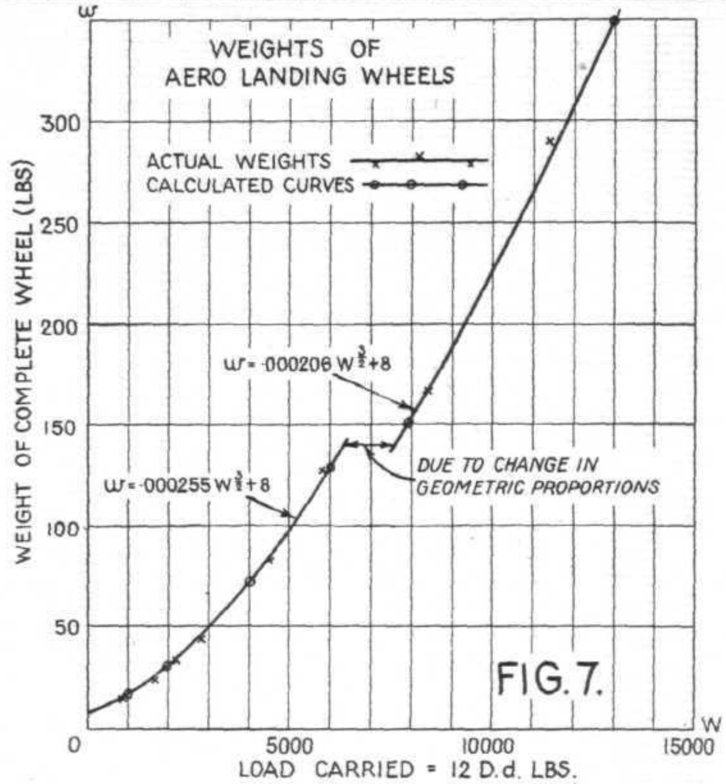


FIG. 6.



downward distributed load equal to $0 \cdot 125$W spread over half the semi-span.

Fig. 6 gives the shape of the load causing bending stresses in the spar, the area ABCE being one-fourth of area OAED.

The expression for the load curve from O to A is $y = \mathrm{L}kx^{\frac{1}{3}}$, and that for the load curve from B to C is $y = 0 \cdot 585\mathrm{L}kx^{\frac{1}{3}}$ (the coefficient $0 \cdot 585$ being that required to fulfil the conditions stated above). The flange volume may be found by using the same process of integration as previously and adding the integrations between the limjts of 0 to $\frac{l}{2}$ and the limits of $\frac{l}{2}$ to l.

The resulting expression for the flange volume is found to be $0 \cdot 948\ \frac{\mathrm{L}l^3}{f}$. The expression for flange volume for the case where all the load is concentrated at the centre is $1 \cdot 208\ \frac{\mathrm{L}l^3}{f}$. The effect of spreading the load is therefore to reduce the weight of the spar flanges to $\frac{0 \cdot 948}{1 \cdot 208} = 0 \cdot 785$ of the previous value.

The effect on the weight of the web will be the same as that on the flanges, and the weight of the rib structure in the middle half of the wing is replaced by the structure concerned with the load that has been spread, to the extent of about one-third. We may now once more evaluate the constants in the general expression for wing weight :—

	Previous Constants.		New Constants.
Spar weight { flanges	0·001683	× 0·785	0·001322
Spar weight { web ..	0·000240	× 0·785	0·000188
Torque member weight	0·001972	× 1·0	0·001972
Weight of ribs, etc. ..	0·0024	× 0·67	0·001610
			0·005092

So that the constant for the actual wing weight will be $\frac{0 \cdot 005092}{0 \cdot 7}$ = approximately $0 \cdot 0073$, a reduction of $18 \cdot 9\%$ on weight of previous design or $32 \cdot 4$ per cent. on the original design. The new value of Ww as a percentage of the central load is shown by Curve III on Fig. 3.

The limit of usefulness of this design occurs at a central load of approximately 50 tons, an improvement of about 66 per cent. over the previous design.

Effect of Increased Wing Loading.

In cases where a high wing loading is permissible, *e.g.*, for flying-boats and for land 'planes operating over suitable country on well organised routes, a further substantial reduction of structural weight is obtainable. Taking the case of the last wing design considered, and making the load per sq. ft. (based on the central load) 50 per cent. greater, we have :—

$$\frac{\mathrm{W}}{\mathrm{A}} = 18 \text{ lb. per sq. ft.}$$

The transformation of $\mathrm{L}l^3$ then becomes :—

$$\mathrm{L}l^3 = \frac{18\ \mathrm{NW}}{\mathrm{W}} \left(\sqrt{\frac{5\mathrm{W}}{3 \times 18}}\right)^3 = 0 \cdot 507\mathrm{N}\ \mathrm{W}^{\frac{3}{2}}$$

The previous value of $\mathrm{L}l^3$, when $\frac{\mathrm{W}}{\mathrm{A}}$ was 12 lb. per sq. ft., was found to be $0 \cdot 623\ \mathrm{NW}^{\frac{3}{2}}$. The whole of the wing structure is affected to the same extent by this change in design so that the new expression for wing structural weight will be :—

$$\frac{0 \cdot 507}{0 \cdot 623} \times 0 \cdot 0073\ \mathrm{NW}^{\frac{3}{2}} = 0 \cdot 00595\ \mathrm{NW}^{\frac{3}{2}}.$$

The new value of Ww as a percentage of the central load is shown by Curve IV in Fig. 3, and we now arrive at a limit of about 75 tons central load or a maximum aircraft weight of 90 tons.

Brief Discussion of the Results.

The foregoing investigations are in conformity with the natural laws governing the variation of structural weights with size and demonstrate the difficulty of obtaining economical aircraft structures in large sizes as long as the geometric proportions remain constant. It is found, however, with each successive change in geometric proportions and general

design (mostly rendered possible owing to increase of size) that the difficulty is considerably lessened, the slope of Curve IV, for instance, at the limiting weight, is just half the slope of Curve II.

The spots A, B, C and D, plotted on Fig. 3, represent wing weight percentages of several large aircraft, as closely as they can be estimated from published data ; explanations relating thereto are as tabulated :—

Mark.	Aircraft.	Source of Information.	Remarks.
A	Stieger Wing for "Inverness"	"Aircraft Engineering," August, 1929	Based on full scale test of a monospar construction
B	Junkers G.38 ...	FLIGHT, November 29, 1929	Power plant weight assumed to be 3·25 lb. per h.p. Total structural weight 39·3 per cent.
C	Dornier DO.X ...	FLIGHT, February 21, 1930	Power plant weight assumed to be 2·5 lb. per h.p. Stripped structural weight 41·2 per cent.
D	Proposed Christmas landplane	FLIGHT, December 13, 1929	Power plant weight assumed to be 3·25 lb. per h.p. Total structural weight 42·25 per cent.

In the absence of data regarding actual wing weights, it has been assumed that the wing weight is one-third of the total structural weight in cases B, C and D. The DO.X wing, admittedly, is partly strut-braced, but there is actually not much to choose between the structural weight percentages of cantilever and strut-braced monoplane wings.*

In the case of the Christmas monoplane, the wing weight would appear to be low when the comparatively light loading of 14 lb. per sq. ft. is taken into account, but this low weight may be possible of achievement owing to the greater distribution of loads on the wing.

The land-plane is at a natural disadvantage as compared with the flying-boat† because wheel weights,‡ comprising the largest proportion of the undercarriage structure, increase according to the load to the power of $\frac{3}{2}$, whereas in the case of flying-boat hulls the displacement varies as the cube of the linear dimensions and therefore directly as the hull weight if geometrically proportional. But in larger sizes the scantlings and shell plating thickness need not be proportional, so that the hull structural weight percentage actually *decreases* with increase of size as is shown by the figures for the weights per cubic foot of hull volume of the Dornier series of hulls, published in FLIGHT of February 21, 1930.

In conclusion, we may say that it is difficult to predict a limit of size for aircraft, as the element of finesse enters so largely in design ; in the case of flying-boats no definite limit of size is yet in sight.

* *Vide* tables given in Mr. Farren's paper.
† An interesting article on this subject by Dr. Rohrbach is published in "Aero Digest" of October, 1929.
‡ See Fig. 7.

AN ANALYTICAL METHOD FOR ESTIMATING THE TAKE-OFF RUN AND LANDING RUN OF AN AEROPLANE.

By R. S. STAFFORD, A.F.R.Ae.S.

(*Concluded from p.* 14)

[*In the February number Mr. Stafford gave the working of his method, and we promised to give worked examples of the application of the method. This we do in the following columns, with illustrative curves plotted by the author.*—ED.]

Example I—Unstick Run.

The following particulars apply to a biplane of fairly clean design with 150 b.h.p. engine, the airscrew being designed for top speed at sea level.

$W = 3{,}000$ lb. $\quad V_t = 60$ m.p.h. (88 ft./sec.).
$A = 300$ sq. ft.
$\mu = 0{\cdot}05.$
$\lambda = 0{\cdot}067.$

$KB_s = 0{\cdot}0050$ = parasitic drag coefficient for parts in the slip stream.

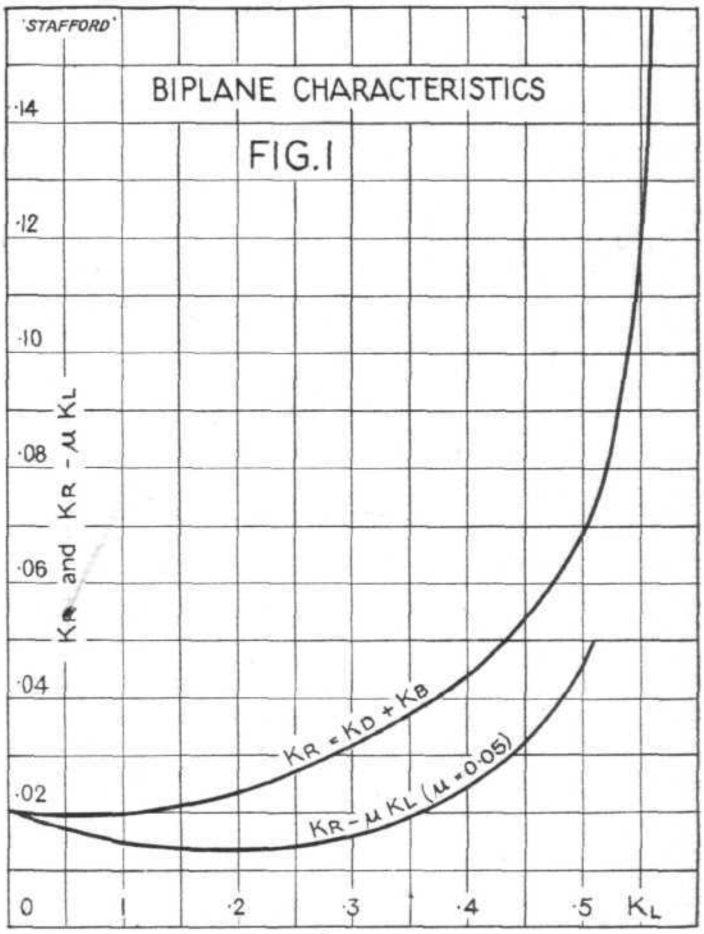


Fig. I shows the biplane characteristics, from which we find a minimum value for $K_R - \mu K_L = 0{\cdot}0138$ for $K_L = 0{\cdot}2$, corresponding $K_D = 0{\cdot}0100$.

From Fig. II we have thrust (T) $= 778 - 2{\cdot}4$ V, *i.e.*, $a = 778$ and $B = -2{\cdot}40$. The mean value of $V_s^2 - V^2$ is 12,500 (ft. sec.)^2.

Hence—

$$D - \mu\Delta L = \rho A(V_s^2 - V^2)(K_{R_s} - \mu\lambda K_L)$$
$$= 0{\cdot}00237 \times 300 = 12{,}500\,(0{\cdot}0050 + {\cdot}067 \times 0{\cdot}0100 - 0{\cdot}05 \times 0{\cdot}067 \times 0{\cdot}2)$$
$$= 8900\,(0{\cdot}0050 + 0{\cdot}007 - 0{\cdot}00007)$$
$$= 44{\cdot}5$$

$$\text{and } b = -\rho A\,(K_R - \mu K_L)\text{ min.}$$
$$= -0{\cdot}00237 \times 300 \times 0{\cdot}0138$$
$$= -0{\cdot}0098$$

$$\therefore \alpha = \frac{-B + \sqrt{B^2 - 4ab}}{2b} = \frac{2{\cdot}40 + \sqrt{5{\cdot}77 + 30{\cdot}5}}{-0{\cdot}0196}$$

$$= \frac{2{\cdot}40 + 6{\cdot}10}{-0{\cdot}0196} = \frac{8{\cdot}50}{-0{\cdot}0196} = -433$$

$$\text{and } \beta = \frac{2{\cdot}40 - 6{\cdot}10}{-0{\cdot}0196} = \frac{-3{\cdot}70}{-0{\cdot}0196} = 189.$$

In the absence of wind for unstick run x, we have :—

$$x = \frac{2\cdot 3W}{bg\,(\alpha - \beta)}\left(\alpha \log_{10}\frac{\alpha - Vt}{\alpha} - \beta \log_{10}\frac{\beta - V_t}{\beta}\right)$$

$$= \frac{2\cdot 3 \times 3{,}000}{-0\cdot 0098 \times 32\cdot 2\,(-433 - 189)} \times \left(-433\ \log_{10}\frac{-433 - 88}{-433} - 189 \log_{10}\frac{189 - 88}{189}\right)$$

$$= \frac{2\cdot 3 \times 3000}{\cdot 0098 \times 32\cdot 2 \times 622}\left(-433 \log_{10}\frac{521}{433} - 189 \log_{10}\frac{101}{189}\right)$$

$$= 35\cdot 1\,(-433 \log_{10} 1\cdot 204 - 189 \log_{10} 0\cdot 534)$$

$$= 35\cdot 1\,(-34\cdot 9 + 51\cdot 4) = 35\cdot 1 \times 16\cdot 5 = \underline{579 \text{ ft.}}$$

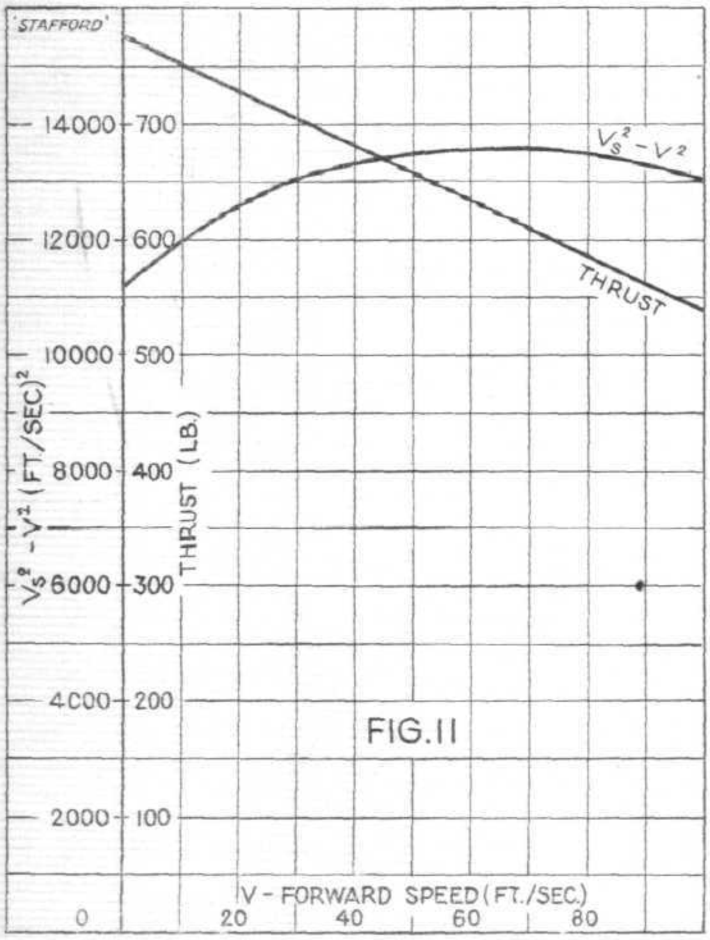


FIG. II

A similar calculation is carried out using equation (4) for taking off into wind, and Fig. III shows the variation in the length of the take-off run with varying wind speeds.

The simplicity of the method is illustrated by the tabular calculation (Table I).

Example II—Landing Run.

The same particulars are assumed to apply, as in Example I. except that the aerodynamic characteristics now correspond to the landing attitude.

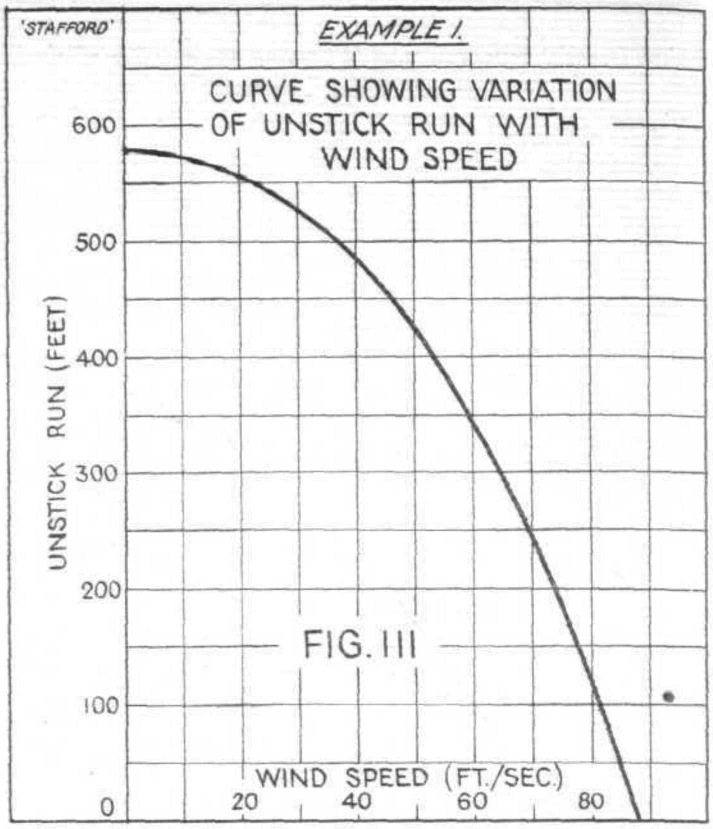


FIG. III

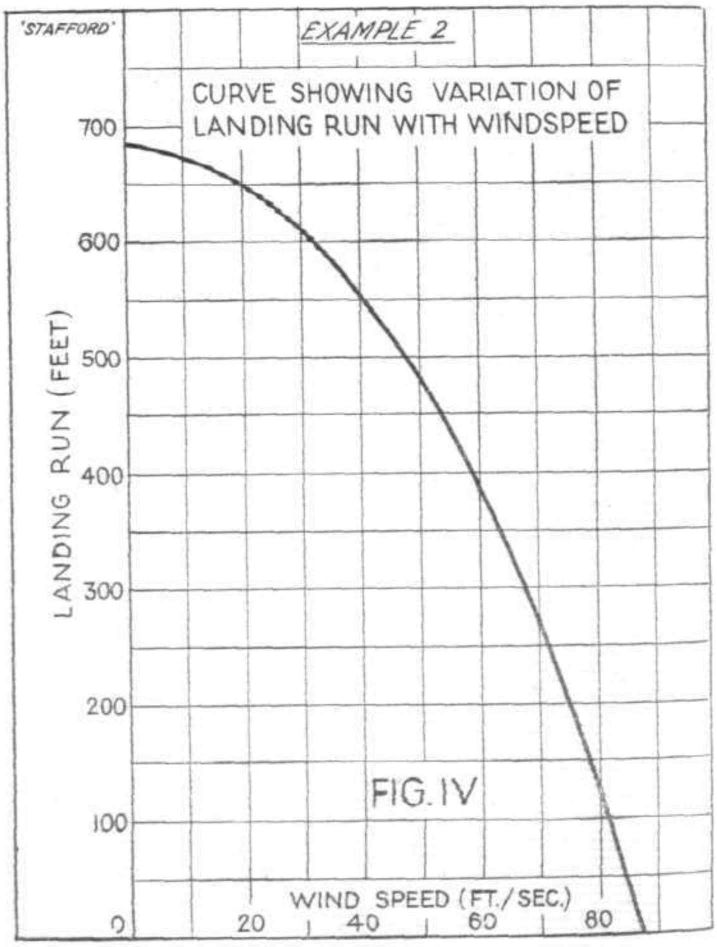


FIG. IV

Table I.

$V_t - \alpha = 521.$ $\qquad$ $V_t - \beta = -101.$

U Ft/sec.	$U - \alpha$	$\frac{V_t - \alpha}{U - \alpha}$	$\log_{10}\frac{V_t - \alpha}{U - \alpha}$	$\alpha \times \log_{10}\frac{V_t - \alpha}{U - \alpha}$	$U - \beta$	$\frac{V_t - \beta}{U - \beta}$	$\log_{10}\frac{V_t - \beta}{U - \beta}$	$\beta \times \log_{10}\frac{V_t - \beta}{U - \beta}$	C_1	Run Feet
20	453	1.150	0·0607	−26·3	−169	0·598	−0·223	−42·2	15·9	558
40	473	1·101	0·0418	−18·1	−149	0·678	−0·169	−32·0	13·9	488
660	493	1·056	0·0237	−10·3	−129	0·783	−0·106	−20·0	9·7	340

$$\left(\text{where } C_1 = \alpha \log\frac{V_t - \alpha}{U - \alpha} - \beta \log\frac{V_t - \beta}{U - \beta}\right)$$

$$\alpha = 14^\circ. \qquad K_L = 0{\cdot}5.$$
$$K_D = 0{\cdot}0490. \quad K_R = 0{\cdot}0690.$$
$$\mu = 0{\cdot}2 \text{ (with brakes) } \mu K_L \text{ max.} = 0{\cdot}112.$$
$$V_o = 59{\cdot}2 \text{ m.p.h.} = 86{\cdot}8 \ (K_L\text{max.} = 0{\cdot}56).^*$$
$$K_R - \mu K_L = 0{\cdot}0690 - 0{\cdot}2 \times 0{\cdot}5 = -0{\cdot}0310.$$

From equation (4) we have :—

$$x = \frac{15{\cdot}06 \times 10}{-0{\cdot}0310} \log_{10} \frac{\cdot112 - \cdot031}{\cdot112 - \cdot031\ \lambda^2{}_1}$$
$$= -4860 \log_{10} \frac{0{\cdot}081}{\cdot112 - \cdot031\ \lambda^2{}_1}$$
$$= -4{,}860 \log_{10} C_2$$

Table II.—(See Fig. IV.)

U ft./sec.	λ_1	$\lambda^2{}_1$	$0{\cdot}031\lambda^2{}_1$	$0{\cdot}112-0{\cdot}031\lambda^2{}_1$	C_2	$\log_{10}C_2$	Run ft.
0	0	0	0	0·1120	0·723	−0·141	685
20	0·230	0·053	0·0016	0·1104	0·734	−0·134	651
40	0·461	0·212	0·0066	0·1054	0·768	−0·115	559
60	0·691	0·478	0·0148	0·0972	0·832	−0·080	389

* It is usually possible to land an aircraft at a lower speed than is given by $V_o = \sqrt{\frac{\omega}{\rho K_L\text{max}}}$, due to a considerable ground effect. Thus the alighting speed in the example above would be of the order of 55 m.p.h. in practice. This can be allowed for in the calculations, by taking $K_L\text{max} = \sqrt{\frac{\omega}{\rho \bar{V}_0^2}}$ where $\bar{V}_0$ = alighting speed (in ft./sec.) allowing for ground effect.

In the above, it is assumed that the aircraft lands with brakes "on." this condition is difficult to obtain in practice, as pilots are always apprehensive lest a locked wheel should cause the aircraft to overturn. The pilot usually waits until after the instant of touching the ground before applying the brakes, so that the run commences at a lower value of μ than that corresponding to brake fully on. However, since the wings are practically supporting the weight of the aircraft at the initial stages of the landing run, *i.e.*, $\mu \times$ (W − lift) is small, the error introduced by the assumption that brakes are "on" throughout the run is not large.

AN ANALYTICAL REVIEW OF THE AERO ENGINE EXHIBITS AT OLYMPIA

By N. E. KEARLEY, A.M.I.E.E., A.M.I.A.E.

(*Concluded from page* 15.)

[*With this instalment Mr. Kearley brings to a close his analytical review of the aero engines exhibited at Olympia. Lack of space has prevented us from completing this series of articles in a shorter time, but fortunately, aero engines do not "go out of fashion" very quickly, and thus Mr. Kearley's review, although dealing with an event that is now a good many months old, has not been rendered out of date by any important changes in design since the exhibition at Olympia. We hope, at a later date, to be able to persuade Mr. Kearley to deal with other aspects of aero engine design.*—ED.]

In concluding this series of articles on the engines at the Aero Show, there remains only a few comments to be made on the subject of ignition, and on the few interesting or novel arrangements of the auxiliaries and their drives of the water-cooled engines, and finally on the performance characteristics of the engine exhibits as a whole.

Almost the only point of interest regarding the ignition arrangements is that of the twenty-seven water-cooled engines shown, two only were provided with coil ignition, these being the 600-h.p. inverted broad-arrow type Farman, and the 800-h.p. V-type Mercedes-Benz. The latter also has one set of plugs supplied by a magneto, this engine thus being provided with a "mixed" dual ignition system. Both these engines are fitted with electric starting motors. The big Fiat A 25 twelve-cylinder V-type engine was unique among the exhibits in having four sparking plugs per cylinder. With the above exceptions, and of course the Sunbeam compression ignition engine, the ignition arrangements of the water-cooled engines were of the usual form in which two high-tension magnetos supply duplicate sets of sparking plugs.

With regard to the arrangement of accessories and of auxiliary drives, the water pumps and their driving gear provide one field for comparison. In the majority of cases, one pump was deemed sufficient, this being fitted at the rear of the engine with the spindle arranged vertically below the driving gear of the camshafts, magnetos, etc., but on some of the larger engines, notably the Sunbeam Sikh III and the Mercedes-Benz, two pumps were provided, the arrangement on the German engine being unusual, in that they are fitted one outside each cylinder bank at the rear, where they are driven by a transverse shaft. The arrangement of the water pumps of the Sikh, namely, side-by-side below the centre of the sump, is also unusual.

The disposition of the drive and magnetos fitted to the Napier racing Lion forms an interesting exception to the general practice of grouping these accessories at the rear of the engine, where they are usually driven one at each end of a cross shaft. In the racing Lion, the overall length of the engine has been reduced by utilising the space surrounding the reduction gear housing, the magnetos being fitted alongside the gear casing, and arranged with their axes almost parallel to the axis of the airscrew shaft, the distributors facing rearwards.

The lubrication systems, in most cases, incorporated gear-type pumps, but in at least one case, namely, the Lorraine type Ed. twelve-cylinder broad-arrow engine, plunger-type pumps are employed, driven by eccentrics mounted on an auxiliary shaft. The dry sump system was almost exclusively employed, although the three 6-cylinder in-line engines were provided with oil-base crankcases. All the Renault engines shown were provided with centrifugal oil purifiers. Engine-driven fuel pumps were more in evidence on the foreign engines than on the British.

Perhaps one of the most interesting and unusual features to be found among the auxiliary driving gear arrangements at the Show was that provided by the new Rolls-Royce engines, in which a torsionally flexible shaft and friction damper is inserted between the rear end of the crankshaft and the driven elements. This device allows a limited amount of "spring" to take place, so that the irregularities of the drive from the crankshaft are not transmitted to the gearing driving the auxiliaries, the device also serving to damp the torsional oscillations of the crankshaft.

Performance.—Regarding the all-important matter of performance, it behoves one to tread somewhat warily when making comparisons. For this reason, the fuel and oil consumption figures of the individual engines were purposely omitted from Tables I and II. Fair comparisons cannot be made unless the performance figures given are absolutely reliable, and have been obtained under similar conditions of test. As the performance figures supplied by all the different makers relating to their exhibits obviously could not conform to these requirements, particularly to those of the foreign engines, it would serve no useful purpose to set these out in tabular form. One has, however, obtained sufficient reliable data to provide some average figures for the different types which enable comparisons to be made between the performance characteristics of these types in general. Actually, there is surprisingly little variation in performance between the different types, more particularly in regard to fuel consumption. In comparing engines of similar size and compression ratio, it would be reasonable to expect the influence of cylinder arrangement to show itself in the performance by affecting the fuel consumption. As, however, this is not the case, all arrangements giving equally good results, it is clear that the mechanical efficiency, mixture distribution and combustion efficiency are not seriously affected by the existing different cylinder arrangements and construction.

Among the air-cooled engines, the consumption of the radials varies with compression ratio between 0·57 and 0·5 lb. per b.h.p. hour, the oil consumption ranging between 0·02 and 0·04 lb. per b.h.p. hour, the larger engines appearing to be somewhat heavy on oil. The in-line engines appear to have slightly better fuel consumption figures and show a

marked improvement over the radials in oil consumption, some being well below 0·02 lb. per b.h.p.-hour. On the other hand, the horizontal opposed engines also appear to be as wasteful of oil as the radial type, but the fuel consumption is about the same as that of the others.

A definite improvement in both fuel and oil consumption can be observed when comparing the characteristics of the water-cooled engines with those of the air-cooled, the fuel consumption varying with compression ratio from 0·55 to 0·46 lb. per b.h.p.-hour, whilst the oil consumption varies from 0·01 to 0·03 lb. per b.h.p.-hour, irrespective of cylinder arrangement in each case.

In conclusion, it may be remarked that although it would be interesting to attempt to work out a formula for providing a "figure of merit" for engines, somewhat as suggested by Mr. Poulsen in his editorial comments in the AIRCAFT ENGINEER at the time when the second or third of these articles was published, this formula taking into account such factors as weight/power ratio, specific fuel and oil consumption and frontal area, such a formula would not necessarily indicate the most suitable type of engine for any particular job. There is, in fact, very little overlapping among the rival types, each having its own particular sphere of usefulness. For instance, where high power (exceeding 500 h.p.) is required from a single unit, or where low head resistance and low fuel consumption is essential, the water-cooled engine wins. On the other hand, where ease of maintenance is concerned, as for the owner pilot, or immediate readiness for action is essential, as for defensive aircraft, the air-cooled engine has it. So much depends upon the duties which the engine is required to fulfil that it is impossible to generalise regarding the "best" type of engine.

Finally, may one speculate as to what the next Show will bring forth ?—Many more compression ignition engines, one hopes, and surely alternative forms of cooling and even better power/weight ratios, but probably not many more single units exceeding 1,000 h.p. Light 'plane engines will, in all probability, be in mass-production, by Morris and others, by that time.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses : Adastral House, Kingsway, W.C.2 ; 120, George Street, Edinburgh ; York Street, Manchester ; 1, St. Andrew's Crescent, Cardiff ; 15, Donegall Square West, Belfast ; or through any bookseller.

THE DISTRIBUTION OF PRESSURE OVER A SECTION OF AN AIRSCREW BLADE IN FLIGHT, AND THE VARIATION OF LIFT COEFFICIENT WITH THE SPEED OF THE SECTION. By E. T. Jones, M.Eng. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1256. (Ae. 405.) (23 pages and 20 diagrams.) February, 1929. Price 1s. 3d. net.

It was decided in 1918 to make a complete investigation of the distribution of pressure over the entire surface of an airscrew blade in flight, as little was known of the pressure distribution over airscrew blades or of the effect of tip speed on the performance of an airscrew, and a satisfactory airscrew theory had not been advanced. Since that date, the pressure distribution over the entire blades of a model airscrew has been measured, airscrew theory has advanced in the light of the vortex theory developed by Prandtl and Glauert, the effect of tip speed on the performance of a model airscrew has been investigated, and the characteristics of a model airscrew deduced at speeds up to and above the speed of sound by measuring the thrust and torque grading curves along the blade.

An Appendix to this report gives a précis of the experiments made during the development of a special manometer, discusses the accuracy of the present work and describes major difficulties encountered while obtaining the results.

The most important of the six prepared sections from an aerodynamic point of view, that is, the section whose radius was 0·87 of the tips radius and at which the effect of high velocity would be most noticeable, was chosen first and results obtained for this section on each blade over a large range of advance per revolution and over as large a range of tip speed (0·47 to 0·86 of the speed of sound) as possible. The work was interrupted by a breakdown in the apparatus for winding on the photographic paper, and finally abandoned in April, 1926, when a breakdown in the glass work of the manometer occurred.

The pressure diagrams are similar to typical aerofoil results at low speeds. As the speed of the section increases the pressure on the upper surface becomes more negative and that on the lower surface less positive.

The lift coefficient of the section increases practically linearly with the speed of the section up to the maximum speed (0·74a) obtained. At a blade section incidence of 1·0° the lift coefficient increases from 0·260 to 0·300 as the speed of the section increases from 0·415 to 0·700 of the speed of sound. This increase is compatible with the increase predicted by theory over the same range of speed.

An attempt was made to measure the blade twist on a wooden airscrew in flight, but the results obtained were inconsistent and could not be applied to the present work. This is unfortunate, as the effects of tip speed cannot be established until those due to airscrew twist are separated from those due to the compressibility of the air. An analysis of the pressure distribution diagrams appears to show that airscrew twist at the section investigated between the range of tip speeds was, if present, small, and that the speed effect on lift is mainly, if not wholly, a compressibility effect.

There is no sign of the "compressibility stall," which is a feature of wind tunnel results of high tip speed airscrews. It appears therefore that this effect is dependent on Reynolds number in addition to the speed and thickness chord ratio of the section. This was foreshadowed in R. & M. 1174*, where the slope of the lift curves of the constant chord airscrew of conventional section at 0·8 R increased with speed up to 0·8a.

It appears that accurate measurements can be obtained with a manometer of the design used in these experiments but, owing to the short life of the glass work comprising the manometer, modifications would be necessary before quantitative experiments could be expeditiously carried out.

* R. & M. 1174. Wind tunnel tests with high tip speed airscrews. Some experiments upon an airscrew of conventional section R. & M. 322 No. 3, at high speeds.—G. P. Douglas, and W. G. A. Perring.

EXPERIMENTS ON FLAME EXTINCTION IN GASEOUS MIXTURES. By Squadron Leader W. Helmore, M.Sc. Work performed for the Aeronautical Research Committee at the Cambridge University Engineering Laboratory. R. & M. No. 1266. (E. 34.) (17 pages and 4 diagrams.) January, 1929. Price 1*s*. net.

The research was primarily undertaken as an extension of the writer's preceding investigation into the "Characteristics and Engine Performance of Gaseous Fuels obtained from Oil,"* which has a special application to airship development. The results are not, however, limited to the special subject of airships but would cover the conditions under which any inflammable gas is required to be used with immunity from fire risks of a similar kind.

The tests made include an examination of the various factors governing flame extinction by surface cooling. The gases tested include hydrogen, ethylene, acetylene, coal gas, "light" oil gas, "heavy" oil gas, "light" oil gas plus 50 per cent. H_2, "light" oil gas plus 90 per cent. H_2. Comparative tables are provided showing the dimensional relationship established between these gases both for turbulent and stagnant gas-air mixtures. The influence of conductivity and explosion pressure is also dealt with.

It has been found that flame may be effectively extinguished in the case of the gases enumerated above by the provision of suitably dimensioned cooling surfaces. The dimensions employed depend primarily in each case upon the type of gas used, its percentage dilution with air, and its physical state, whether turbulent or stagnant. Secondary factors include the explosion pressure, if any, and the material from which the cooling surfaces are constructed.

Several forms of "flame traps" employing the surface cooling principle have been tested in practice and found satisfactory for precluding the passage of flame in hydrogen, oil gas, and petrol-air mixtures.

* Engine performance with gaseous fuels. (R. & M. 1265.)
Part I. Characteristics and engine performance of gaseous fuels from oil.
Part II. Engine performance from kerosene/oil gas mixtures.
Part III. Experiments on flame extinction in gaseous mixtures.

INVESTIGATION OF THE BOUNDARY LAYERS AND THE DRAGS OF THE TWO STREAMLINE BODIES. By E. Ower, B.Sc., A.C.G.I., and C. T. Hutton, B.A. R. & M. No. 1271 (Ae. 417.) (19 pages and 10 diagrams.) September, 1929. Price 1*s*. net.

In view of the interest recently aroused regarding the flow past streamline bodies and its effect on drag, it was thought worth while conducting measurements on the two streamline bodies selected for the general research on interference.

The main object of the experiments was to determine the thickness of the boundary layer and the position of the transition from laminar to turbulent flow. The latter was defined by a change in the type of distribution in the layer, and was found to occur at values of Vt/V between $5 \cdot 7 \times 10^5$ and $9 \cdot 4 \times 10^5$, where t is the axial distance of the section from the nose of the body. No change in thickness of the layer was perceptible in the transition region. With the short body the thickness of the layer at a given section was found to increase with wind speed. The marked thickening of the layer that takes place to the rear of the maximum diameter of a streamline body is shown to be due to the effect of the converging taper of the body and not necessarily attributable to a break-away of the flow from the surface.

The drag of a bare streamline body as measured in different tunnels may vary within wide limits, but if the flow in the boundary layer is rendered turbulent over the full length of the body, either by the attachment of fine rings of thread to its nose, or by the introduction of a cord network across the tunnel upstream of the body, the measurements in the different tunnels are brought into good agreement. The number of threads required to produce completely turbulent conditions depends upon the tunnel and upon the shape of the body (probably the shape of the nose).

Pressure plotting of the surface of the short body enabled the total drag to be separated into its skin frictional and pressure components, and the former agreed well with the skin friction on a flat surface. An estimate of the skin friction on the long body, using previously published figures for the pressure distribution, did not, however, result in equally good agreement with flat plate values. This point will receive further attention, and additional data on the skin friction and drag of streamline bodies of different fineness ratios will be obtained from experiments shortly to be begun.

AIR TRANSPORT

AIR TRANSPORT IN MEXICO

AVIATION has taken a strong foothold in the Republic of Mexico. Sponsored and developed by military, civil, and commercial interests, aeroplanes, air lines, airports, and air-mindedness have entered into the consideration and plan of progress of the country as definitely as if the introduction of aviation had been made there a score, instead of several, years ago.

The military aerodrome and headquarters for the Mexican Air Force (Valbuena Field) is large and equipped with suitable hangars and other facilities. The Mexican Ministry of War and Marine is giving particular attention to the Aviation branch and is increasing the Air Force from one to two regiments, of 82 planes each. In addition, 165 officers and men will be assigned to the workshops, and 114 to the aviation school. For the year 1930 approximately $101,000 has been assigned for the pay and allowances for 91 pilots and $850,000 for new aeroplanes. Altogether, the Government has allotted $1,636,195 for aeronautical purposes during the year 1930.

The new civil airport, located on the road that leads from the City toward the mighty and distant Popocatepetl and Iztaccihuatl, and diagonally across from Valbuena, will be, not only the best equipped airport in Latin-America, but one of the best in the world. Working under the supervision of the Mexican Government, and with a division of expenditure, and a contract assuring the Mexican Aviation Company controlling interest over other commercial companies for a period of twenty years, this organization began work on the 230-acre plot in October, 1929.

At this time three 132-ft. by 4,000-ft. runways, two hard surface and one grass covered, had been completed, a drainage system, commonly referred to as the French Drainage System, had been installed, and the large and beautiful hotel-station was nearing completion. During the next fiscal year the Mexican Aviation Company will expend $150,000 at the airport, and the Mexican Ministry of Communications and Public Works will spend an equal amount to improve the airport further.

The hotel-station will be as unique in design as it will be practicable. From the air it will take the shape of an aeroplane. The main section will include waiting rooms, rest rooms, a dining room, writing room, and office down stairs, and thirty bedrooms with baths upstairs. Across the taxi runway in front of the building, and reaching to the operations office, will be an awning covering that will serve as a protection to the passengers and appear as the fuselage in this giant aeroplane design.

When ready for use, which should be this month, this field will be utilized by all commercial companies and visiting planes. Concessions for oils and gasses will be let and mechanic services will always be on hand. It is expected that in the first part of the summer the field will be entirely complete.

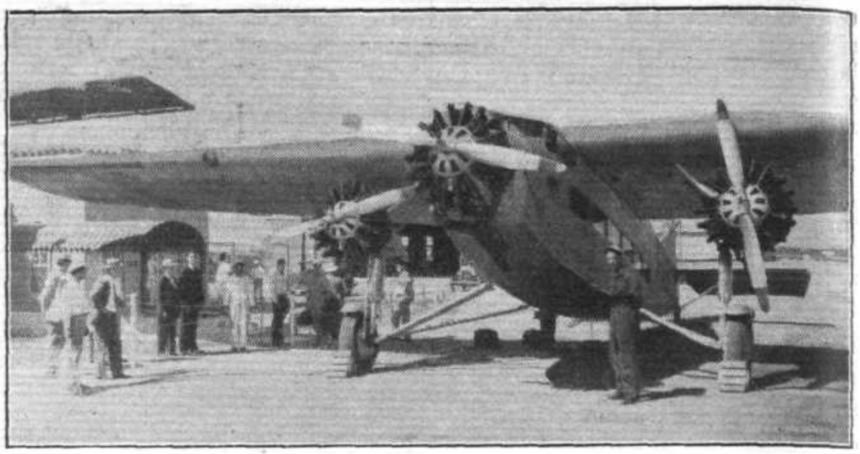
Other airports are fast taking form in the Republic. Tampico's new field boasts two completed runways, and the construction of a hangar will be under way soon. Before six months have passed it is likely that the present field will be discarded for the new. Merida, on the peninsula of Yucatan, has a large field with a triangular runway and an all-steel hangar, This field is unusual in that the entire runway surface was blasted from rock. Improvements are being made at the Tejeria airport near Vera Cruz. Along the west coast landing fields are being selected and improvements

AIR TRANSPORT IN MEXICO: Aerial view of the new Civil Airport at Mexico City, that will be the best equipped in Latin-America when completed. Across the road from the field, and in the foreground, is the Azcarate Aeroplane Factory—the only one in Mexico.

made. Torreon and Durango have started construction on airports. All the small towns along the commercial lines have landing fields which look hopefully toward the day when they may grow into airports. Over the entire Republic of Mexico the need of airports and landing fields is growing and work is progressing simultaneously in all parts

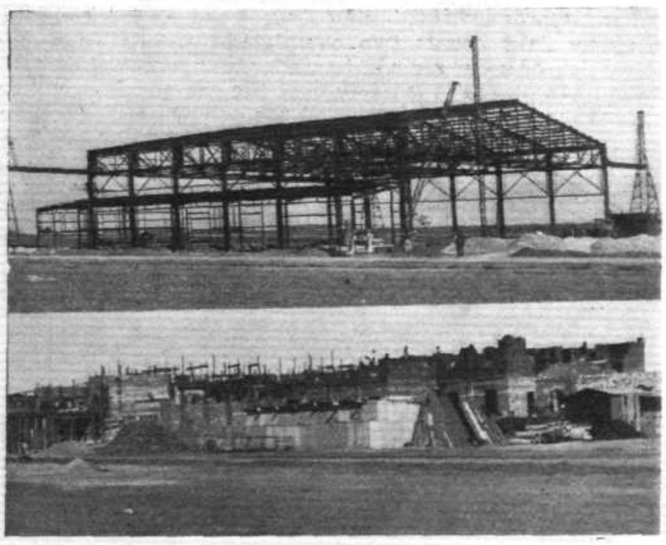
Companies operating airlines over the various parts of Mexico have multiplied rapidly and have made the people in the towns and cities of this country, so widely separated by mountains, realize the potentialities of air transportation. Air travel and air express offer an exchange almost unlimited between these widely segregated parts. Already the people dream of the time when airports will be as common and important to their city as the railroad stations.

In 1920, Miss Aviation fostered by Mother Necessity, made her debut in Mexico. During the great oil boom in Tampico large amounts of silver and gold circulated between the companies and in the payrolls of each company. Losses to bandits were frequent and heavy. Aeroplane service was inaugurated to deliver the sacks of silver from the headquarters to the field offices. In 1924, this service was increased to include lines from Tampico to Vera Cruz and points on the west coast.



A tri-motored metal Ford monoplane, the type employed by the Mexican Aviation Co. on the air services operated by them.

Today this same service, originating in Tampico, has grown into a large company, the Mexican Aviation Company, and operates daily services from Brownsville to Mexico City and from Tampico to Vera Cruz. A tri-weekly service operates from Vera Cruz to Merida, and from Vera Cruz into Central America, making the first stop south of the Republic of Mexico in Guatemala City. Ford tri-motor planes are used, and service de luxe is furnished air travellers over these lines. With a pilot, co-pilot, radio operator, and steward, these planes transport passengers in seven hours over parts it would take six or eight days to cover by train.



The framework of the 120 ft. by 120 ft. steel hangar being constructed at the Civil Airport in Mexico City is seen in the upper picture. Below is a section of the $400,000 Administration, etc., Building at the same airport.

All-expense air excursions from the United States to Mexico City and return, from the border or from the Capital to Tampico, the tarpon-fishing grounds of the continent, have been inaugurated. Offering unexcelled service, some of these lines have been operating regularly for almost a year.

Four other more recent lines have been organized and are operating, making an aerial web over Mexico. Connecting with their 'bus lines over the United States, the Pickwick lines operate along the western coast from Tiajuana adjoining California to San Salvador via Mexico City. Ryan J-6 planes are used on this mail, passenger and express service.

The C.A.T. (Compañia Aeronautica de Transportes) uses Lockheed Vega planes on their lines, which extend from Brownsville (Texas) to Mazatlan on the west coast, and from El Paso (Texas) to Mexico City, the two lines crossing at Torreon, the company headquarters.

A tri-weekly airmail and passenger service connecting Guadelajara and San Luis Potosi with Torreon was inaugurated the last part of 1929. Bellanca planes are used by this company, of which Eduardo Meade, capitalist of San Luis Potosi, is president. He plans to extend his lines to the border at Eagle Pass in the near future.

Making their profits largely from their concessions to carry air mail, these pioneers of air transportation in Mexico are rapidly improving their lines and airports. For the people of isolated villages that are being added to the list of stations for the passenger planes, these metal birds of the air are like great and amazing breaths of a new and strange civilization. The passengers who step out to stand under the reed roofs at the landing fields are often quite as much of a curiosity to the natives as the natives are to the casual American or European traveller.

The strides with which aviation is bringing together the different stages of civilization, as illustrated in Mexico, is breath-taking.

M. C. C.

Artificial Sea-dromes

According to the *Daily Telegraph* Montreal correspondent, the creation of artificial lakes around Winnipeg for the landing of seaplanes and provision for the general equipment necessary for a modern air port figure in proposed amendments to the City charter of Winnipeg, which are to be presented to the Manitoba Legislature.

Transatlantic Airship Projects

It is announced from New York that Dr. Hugo Eckener, of the Zeppelin Luftschiffbau, has succeeded in arranging for a company to be formed to run an airship service between Europe and North America. Parties to the agreement include the National City Bank of New York, the United Aircraft & Transport Corporation, the Union Carbide Co., the Aluminium Co. of America, and the Goodyear Zeppelin Corporation of Akron, Ohio. It is proposed to build airships both in the States and in Germany. Dr. Eckener is said to have rejected New York as a terminus on account of unfavourable weather conditions, and he has gone to Baltimore to examine conditions there. The intention is that internal distribution from the airship station shall be carried out by aeroplane. It is also reported that President Hoover and various State Departments are much interested in the project. Meantime the plans of the Spanish-German Company for an airship service from Seville to South America are proceeding with deliberation.

The Melbourne-Hobart Air Mail Service

The Mathews Aviation Co., of Victoria, which proposes to inaugurate an air mail and passenger service between Melbourne and Hobart very shortly, has selected a landing ground 1,000 yards square on Wilson's Promontory as an emergency facility for the service This service will be operated with the Saunders-Roe "Cutty Sark" amphibian flying-boat (two "Cirrus Hermes") now due to arrive in Australia. A stop will be made at Launceston, and the fares will be as follow: Melbourne-Launceston, £10 10s.; Melbourne-Hobart, £13 13s.

AIRISMS FROM THE FOUR WINDS

India-England Flight Concluded

MR. R. N. CHAWLA, the Indian pilot, who left Karachi in a D.H. "Moth," accompanied by Mr. Engineer, on March 3, in an attempt to win the Aga Khan prize for the first Indian to fly between England and India, arrived in England on March 20. He left St. Quentin in the morning, and a large gathering awaited his arrival at Croydon, including Mr. F. L. Bertram, representing Lord Thomson, Mr. A. M. Green (India Office), Mr. W. H. Peck (Royal Aero Club), and the Mayor of Croydon. Mr. Chawla, however, encountered dense fog after crossing the French coast and lost his bearings, eventually landing at Thetford Aerodrome, Norfolk. He continued his journey to Croydon the following day, and was greeted by Mr. Bertram and others ; in the evening, Mr. Chawla and his passenger were entertained at a reception by Indian students, and the next day they were the guests of Lord Thomson at an informal luncheon. The Director of Civil Aviation announced in an official *communiqué* that the Governor-General had granted Mr. Chawla 7,500 rupees (about £560) in recognition of his achievement, and said that the flight complied with all the conditions laid down for the Aga Khan's prize, except that Mr. Chawla flew in company with Mr. Engineer, son of Mr. K. H. Irani, of Karachi, who provided the aeroplane, whereas to be eligible for the prize a solo flight must be made. The Viceroy of India sent him the following telegram :—" I send you and Mr. Engineer my hearty congratulations on the successful accomplishment of the first flight by an Indian pilot from India to England."

Australia-England Flight

MR. DAVID SMITH, a young Australian pilot, accompanied by Lieut. Shiers (who flew with Sir Ross and Sir Keith Smith from England to Australia in 1919), left Sydney at sunrise on March 24 for England in a Ryan monoplane.

Another England-Australia Attempt

MR. C. H. PARKERSON, a New Zealand business man, left Lympne in a D.H. Moth, on March 23, in an attempt to beat Bert Hinkler's record flight to Australia. Unfortunately, however, he had to make a forced landing, owing to fog, near Liz-sur-Ourcq (35 miles N.E. of Paris) and his machine was damaged. Mr. Parkerson has been training in England for several months, at the Norfolk and Norwich Aero Club and the Cinque Ports Flying Club.

Cape to Cairo Service Flight

THE South African Air Force machines which accompanied the R.A.F. Flight from Cape Town to Cairo, arrived at Pretoria last week on their return flight from Cairo.

Mr. Van Lear Black

MR. VAN LEAR BLACK arrived at Hong Kong from Hanoi on March 19 in his Fokker monoplane, piloted by Geysendorffer and Scholte, in which he is touring the East.

King of the Belgians in Iraq

THE King of the Belgians, with King Faisul of Iraq, Sir Francis Humphrys, Air Vice-Marshal Sir Robert Brooke-Popham and others, flew in a Vickers " Victoria " from Baghdad to Ramadi, on March 18, to inspect the Police Camel Corps. On March 19, he flew to Babylon, and on the following day to Mosul.

U.S. Aircraft for Chili

AN order has been placed in the United States by the Chilean Air Service for 40 military aircraft.

Sir Hubert Wilkins Returns

SIR HUBERT WILKINS, together with Mr. Parker Cramer and Mr. Al Cheesman, his pilots, returned to New York in the *Eastern Prince*, on March 19, from his recent explorations in the Antarctic.

Three-Mile Drop in Parachute

HERR RAESCH, it is reported, last week set up a new parachute descent record at Berlin, when he jumped from an aeroplane at a height of 16,400 ft. His descent lasted 20 mins. 6 secs.

Oxford *v.* Cambridge Boat Race

IN connection with the Oxford *v.* Cambridge Boat Race, which will be rowed on the River Thames between Putney and Mortlake on April 12, the Air Ministry have issued the following warning.—Pilots of aircraft are requested not to fly in the vicinity of the course at a lower altitude than 2,000 ft., either when the race is about to start or during its progress.

Reduced Fares on Air Union Services

THE Air Union, 52, Haymarket, S.W.1, announce a reduction in return fares for Easter, from April 17 to April 23, as follows : Ostend and Brussels, £6 ; Paris, ordinary service, £6 6*s*. ; Golden Ray, £8.

A New Canadian Aircraft Company

THE organisation under the laws of Canada of the Fleet Aircraft of Canada, Ltd., as Canadian subsidiary of the Consolidated Aircraft Corporation, is announced by Major R. H. Fleet, President. " While the Canadian company will be a subsidiary of the Consolidated, both Canadian and American capital is represented in Fleet Aircraft," states Major Fleet. The construction of the Canadian plants on a site at Fort Erie, Ontario, opposite Buffalo, where the plants of the Consolidated Aircraft Corporation are located, is under way, and contracts call for occupancy by May 1, 1930. Initial production will be confined to Fleet training and sports planes, a number of which are now on order from Canada.

The Caterpillar Club

THE latest members of the famous Caterpillar Club are the Rev. K. C. B. Warner, R.A.F. Chaplain, and Flight-Lieut. V. Somerset-Thomas, both of No. 4 Training School, Abu Sueir, Egypt. They jumped with their Irvin parachutes at 1,300 ft. and landed safely. The Rev. Warner is the first padre member of the club. Total membership is now over 250 and includes a large number of Royal Air Force officers and airmen. The Irving Air Chute of Great Britain, Ltd., ask all airmen, military or civil, who are eligible for membership, to write to them, informing them of their experience. Each will be presented with a gold caterpillar pin.

BRISBANE-MELBOURNE IN ONE DAY

FLYING a Gipsy Moth, Messrs. Jules Moxon and C. W. Scott left Eagle Farm, Brisbane, at 4.30 a.m. on February 13 and completed a 1,000-mile flight to Melbourne in the one day, arriving at the Essendon Aerodrome at 6.40 p.m. the same night, where they were met by Frank Penny, aviation officer of the Shell Co. The actual flying time for more than 1,000 miles was 13 hr. 20 min. ; 57 gall. of petrol were used ; and the total cost of the journey, including meals for both men at Sydney, was £6 14*s*.

The Moth was piloted as far as Sydney by Mr. Moxon, and Mr. Scott left Brisbane in another aeroplane which had to be delivered at Mascot before noon. Both airmen left Brisbane in a heavy ground mist, and they did not see each other for more than 100 miles. They reached Mascot Aerodrome at 10.30 a.m., and left again, after having had lunch, at 11.30 a.m., with Mr. Scott as the pilot. Over the Blue Mountains the aeroplane ran into heavy clouds, and although he rose to 7,000 ft., the pilot " flew blind " for about two hours.

" We could not see more than a few yards in front, and neither of us knew the country," remarked Mr. Moxon. " Scott, however, was regarded as the best fog flyer in the Royal Air Force in 1923, and when we came out of the clouds we were only three or four miles out of our course."

The aeroplane reached Cootamundra at 2.40 p.m., and a stop was made for five minutes to refill the petrol tanks. Five minutes more were spent at Bowser, near Wangaratta, and from there the flyers headed straight for Melbourne with the throttle wide open. Despite a strong head wind which met the aeroplane after it had left Wangaratta, the average cruising speed was nearly 100 miles an hour.

Mr. Moxon explained that his firm was taking the agency for De Havilland aircraft products, and the object of the flight was to demonstrate the suitability of light aeroplanes for quick and safe transport in Australia. " Queensland is a State of vast spaces, and up to the present no practical demonstration has been made to show its people the value of air transport," he said. " We have shown that the journey from Brisbane to Melbourne can be made at considerably less cost than a second-class railway fare, with a very great saving of time."

Although the late Mr. C. J. De Garis flew from Brisbane to Melbourne in a heavier aeroplane some years ago, Mr. Moxon's machine has established a record for light aeroplanes. Shell oil and spirit were used during the flight.

MODELS

DOWSETT "HAWK-SPECIAL" POWER-DRIVEN MONOPLANE

MODEL AIRCRAFT, driven by petrol engines, are generally considered to be out of the scope of the average aero-modellist, and the construction of such a machine is rarely attempted, chiefly because it appears, apart from it having to be considerably larger than the general run of models, the weight has to be expressed in pounds instead of ounces, and the enthusiastic modellist, who is striving to knock half-an-ounce off his latest bus, will appreciate the magnitude of the difficulties that are presented by an unavoidable additional one pound, not to mention the several additional pounds that are involved in a petrol driven machine.

down considerably, as several alterations were made during construction, each necessitating further outlay.

The writer is looking forward to the day when power-driven machines will be the rule rather than the exception, and will willingly give all the assistance in his power to anyone intending to build a machine of this type.

The following is a description of the Dowsett "Hawk-Special" monoplane, general arrangement drawings of which are shown in Fig. 1.

The fuselage is of the usual box type, the longerons and cross-members being of $\frac{1}{2}$-in. by $\frac{1}{4}$-in. birch, and the formers of $\frac{1}{16}$-in. 3-ply. Formers and cross-members are

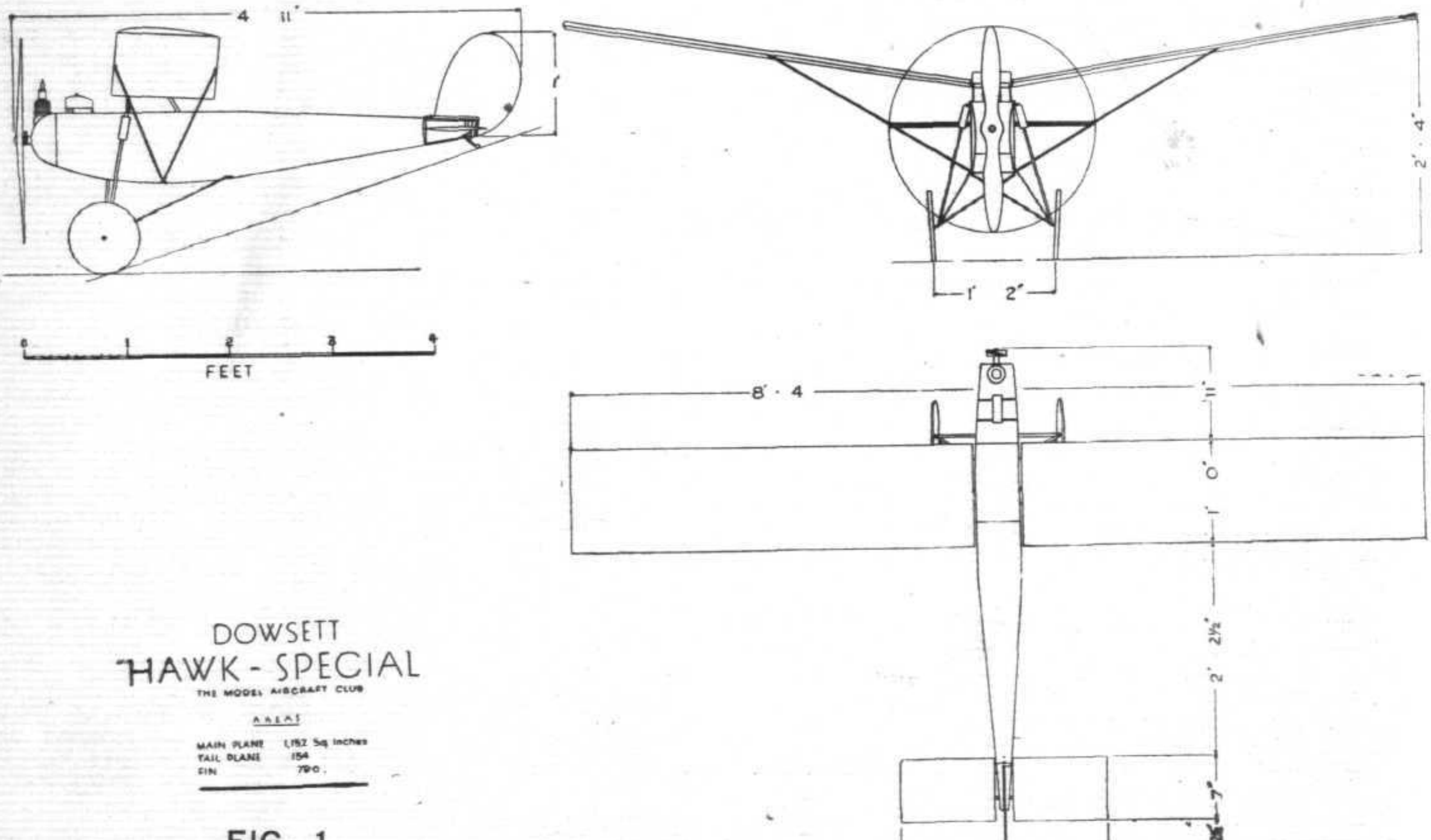


FIG. 1.

The wonderful improvements that have been made in miniature internal-combustion engines in the last few years, (for which we have to thank the power boat men) have given us a power unit, developing nearly half horse-power, the weight of which can be held down as low as 2 lb., excluding the flywheel, which, of course, is unnecessary in aircraft.

The advantages of the I.C. engine applied to model aircraft are numerous, the more important being (1) the time of flight can be increased out of all proportion to the size of the machine, (2) the pull of the propeller is uniform throughout the complete length of run, this not being the case with rubber or compressed air plants, the power of which is constantly decreasing, and (3) the increase in speed permits the machine to keep head on to a wind which would send its smaller brother either scurrying round in a semi-circle, or floating gracefully backwards.

The principal disadvantages are: (1) considerably more space is necessary for flying, (2) the initial cost of building is much greater, and (3) the damage resulting from a crash is far more serious than in a machine weighing only a few ounces.

In the opinion of the writer, the advantages easily overshadow the disadvantages, and this opinion resulted in the design and construction of the "Hawk-Special," described and illustrated in the following notes. With regard to the cost of building, this machine stands in the neighbourhood of £20, but there is no doubt that this price could be cut

placed at intervals of 8 in. throughout the length of the fuselage, and all joints are glued and screwed, with the exception of the vertical members at the nose of the machine. To give these sufficient strength to carry the engine bearings, they are of $\frac{1}{2}$-in. sq. birch, halved, glued and bolted to the ends of the longerons. The second and fourth sections of the fuselage are diagonally braced with $\frac{1}{2}$-in. by $\frac{1}{4}$-in. birch, and although originally the remaining sections were braced with wire, this was found to be unnecessary and was subsequently removed.

The wing housing, which is built direct on to the fuselage, is the next point for consideration. This was originally designed with the petrol tank built in, but during tests with a float controlled carburettor, it was found necessary to move the tank down into the nose of the machine to improve the feed.

The housing is constructed with sides of $\frac{1}{4}$-in. birch, 9 in. long, and of airfoil section, with cross-members of $\frac{1}{4}$-in. sq. spruce. Two eyebolts are fixed through each side, such that when in position, the eyebolts are level with the spars in the main planes, and the leading edge of the housing in a straight line with the leading edge of the planes. Four streamline struts fix the housing to the fuselage, the upper and lower surfaces then being covered with 1 mm. 3-ply.

As will be seen in the illustrations, the undercarriage is practically a replica of that fitted to the Westland Widgeon machine, but is of rather novel construction. The two main

members, incorporating the shock absorbers, were built up from two thin cycle pumps, which were treated in the following manner :—The plunger rod was first removed, and the leather cup-washer reversed. A length ($2\frac{1}{2}$ in.) was then cut off the barrel, connection end, and the open end tapped to take the original bush. A coil spring was inserted, followed by the plunger, and the bush screwed home. The connection hole of the pump was sealed by means of a bolt, which also secures a hinged bracket to the top for attachment to the fuselage. It will now be clearly seen that when the spring is suddenly compressed, the air passes freely out of the barrel past the reversed cup-washer, but its efforts to return to normal are checked by the suction, which was found to be so great that it was necessary to drill a small hole to permit of a slow inlet of air. Fig. 2 shows a section through the completed shock-absorber.

The cross-members of the undercarriage are in two sections, the top half, jointed to the fuselage, being a piece of steel tube, into the end of which is fitted a length of steel rod, $\frac{1}{32}$-in. in diameter. This rod is attached to the shock-absorber leg by means of a flexible joint ; where it is bent almost to the horizontal, and continues for a further $1\frac{1}{2}$ in., this section being the axle on which the wheel is mounted. The undercarriage is completed by the two rods running back from the extremities of the shock-absorber legs to the lower longerons of the fuselage, to which they are firmly bolted.

The wheels are cut out of 9-ply wood, and are 8 in. in diameter, a brass bush being fixed into the centre hole as a bearing for the axle.

The main plane is in two parts, each 4 ft. by 1 ft. A section through the wing is shown in Fig. 3. The ribs are of $\frac{1}{4}$-in. white wood, and are spaced at intervals of 6 in. ; the two end ribs of each section, after being fretted out, were faced with 1 mm. 3-ply, this greatly increasing the strength, and at the same time facilitating the glueing down of the silk covering.

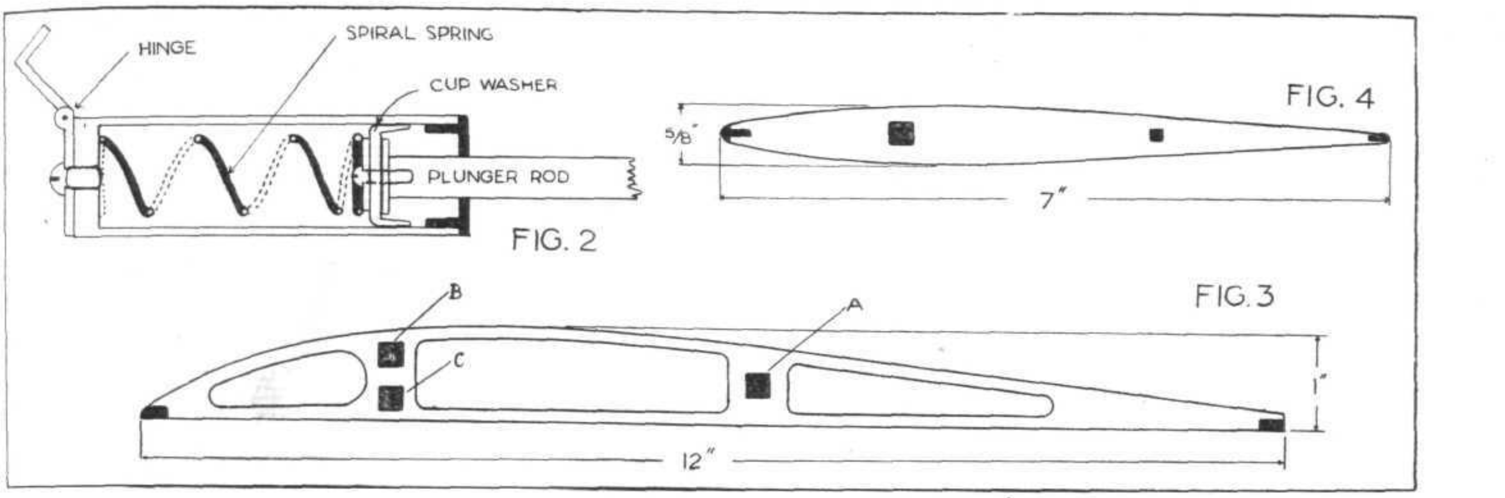
The three main spars, A, B and C, are of $\frac{1}{4}$-in. sq. spruce, and the leading and trailing edges of $\frac{3}{8}$-in. by $\frac{1}{8}$-in. birch. The wing is diagonally braced from the spar A to the trailing edge by means of strips of birch $\frac{1}{4}$-in. by $\frac{1}{16}$-in., these strips being glued and pinned in alternate directions between each pair of ribs.

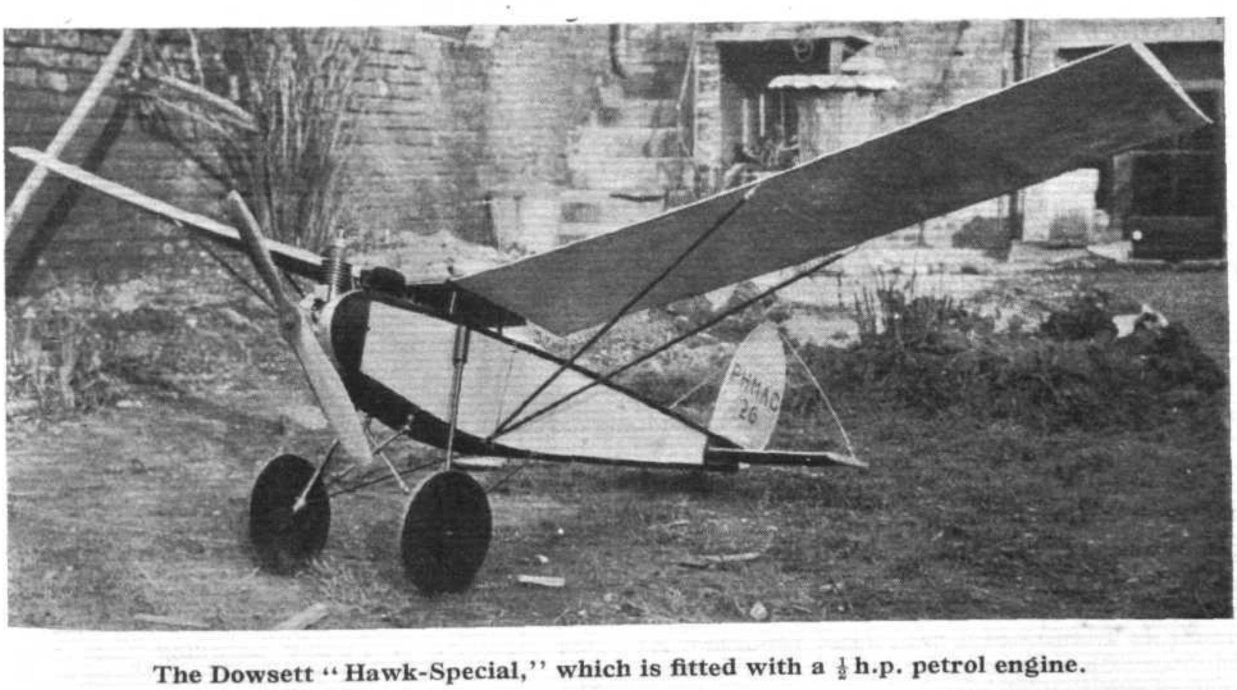
The ends of the V struts are attached to the wing by means of eyebolts passing through the leading and trailing edges, the lower ends of the struts running together into a metal cup. Attached to this cup is a small brass lip, which fits between two eyebolts in the lower longerons of the fuselage, and is locked in position by means of a small steel wire clip.

The wing is attached to the housing by means of two steel wire hooks, which are bound to, and project from the spars marked A and C in the wing section (Fig. 3), these hooks fitting into the eyebolts on the side of the housing.

A section through the tail plane is shown in Fig. 4. The ribs are of $\frac{1}{16}$-in. 3-ply, the spars, leading and trailing edges of birch.

The tail plane is fitted between the upper and lower longerons of the fuselage, the fabric covering of the latter finishing 6 in. from the stern post to permit the adjustment of the incidence angle, which is accomplished in the following manner. The centre of the rear spar of the tail plane is hinged to a block screwed to the upper longerons of the fuselage, the centre section of the wing behind the rear spar being cut away to allow the trailing edge to overlap the stern post. The leading edge is fitted with a small brass bush through which passes a length of threaded rod. A flat brass plate is screwed across the upper longerons of the fuselage, the end of the rod passing through a hole in the centre, and having a fixed bush on the underside of the plate, and a knurled knob on the upper. By turning the knob, the





The Dowsett "Hawk-Special," which is fitted with a $\frac{1}{2}$ h.p. petrol engine.

leading edge of the plane is either lifted or lowered as desired.

The fin is of steel wire construction, and is flat in section. It is attached by means of a straight length of wire (secured to the fin by binding and soldering) which passes through a small copper tube bound to the stern post of the fuselage. At the front of the fin is a curved wire extension which passes through a small terminal also attached to the fuselage. The fin is then adjustable on the balanced principle, and can be locked in any desired position by means of the screw in the terminal. On preliminary tests, the fin showed signs of serious flutter, and it was therefore necessary to brace it by means of wires from the top to the ends of the tail plane. Main planes, tail plane and fin are all covered with jap silk and coated with aluminium dope.

The engine is an air-cooled two-stroke, having a bore and stroke of 1¼-in. The cylinder is machined in one piece, the top being drilled and tapped to take a standard size rotary engine sparking plug. The piston has a deflector head, and is fitted with two rings, spaced ⅛-in. apart. The crankcase is of aluminium, and is made in two parts, bolted together, the front section carrying the single crankshaft bearing. On either side of the crankcase is a projecting fin, the engine being mounted to the fuselage by bolting each of these fins between two steel brackets, the brackets in turn being bolted to the vertical members at the nose of the fuselage. The crankshaft, which is balanced, carries a bush, from which project a number of steel pins corresponding with holes in an aluminium bush set in the propeller boss, the propeller being secured by means of a nut screwed on the end of the crankshaft. The make and break, which is the usual brush and pin contact, is immediately behind the propeller boss, the fitting carrying the brush being attached in a manner which permits of it being rotated, thus making an efficient ignition adjustment.

The ignition is in the form of a trembler coil, and a standard size pocket torch battery. The coil, which was purchased from Messrs. Gamage's, measures 2½ in. by 1½ in. by 1 in., and gives an efficient spark from a small input. The coil and battery are located on a hinged flap of 3-ply wood on the under side of the fuselage, slightly behind the main plane. Leads to plug, etc., are carried through the fuselage, and come out immediately behind the engine.

As has been previously stated, the original arrangement for petrol supply was to have the tank in the wing housing, the carburettor being at that time merely an atomizing tube with a needle valve operated by gravity only. On test, however, the vibration seriously upset the flow of petrol from the tank, and air bubbles passed into the tube, causing a missfire which, with only a light propeller as flywheel, frequently caused the engine to stop altogether. This fault was remedied by fitting a miniature float controlled carburettor bolted direct to the cylinder, and moving the tank to a position immediately above the float chamber.

The petrol tank, built up from sheet brass, measures 3 in. by 1½ in. by 1 in. (this holding sufficient petrol to run the engine full out for about 25 minutes) and is fixed to the fuselage by means of brass brackets soldered to the tank, and screwed to the longerons.

The engine cowling is built up from 1 mm. 3-ply wood and aluminium, and four screws secure it to the cross-members at the front of the fuselage.

A coarse pitch four-bladed propeller, of 18-in. diameter was originally fitted to the machine, the maximum speed of the engine with this being about 900 r.p.m. A 24-in. two-bladed propeller of fairly fine pitch was then substituted, which increased the engine speed to 1,250 r.p.m., and considerably improved the all-round performance of the machine.

Considerable interest was shown in the Hawk-Special when it was exhibited on the stand of the Model Aircraft Club at the last Model Engineer Exhibition, and the publication of this article was promised to many visitors.

Space prohibits the article being written in sufficient detail to enable readers to construct a similar machine, but should anyone desire to do so, the writer will be glad to answer any enquiries regarding points in the construction which are insufficiently explained. Letters should be addressed to :—Herbert H. Dowsett, c/o The Editor, FLIGHT.

A brief specification of the "Hawk-Special" is as follows :—

Type, Parasol monoplane ; power, internal-combustion engine, ½-h.p. at 1,200 r.p.m. ; span, 8 ft. 4 in. ; chord, 12 in. ; overall length, 4 ft. 11 in. ; total wing area, 1,306 sq. in. ; fin area, 79·6 sq. in. ; total weight, 7 lb. ; wing loading, 12·4 ozs. per sq. ft. ; capacity, 25 minutes.

THE MODEL AIRCRAFT CLUB (T.M.A.C.)

THE meeting held last Wednesday at the Junior Institution of Engineers under the chairmanship of W. R. Burnett, Esq., was very successful. The most important event of the evening was the presentation of a very handsome challenge cup (illustrated herewith) given to the Club by A. Terrence Godfrey, Esq. This was accepted by the deputising chairman on behalf of the members amidst great enthusiasm of the members present, of whom approximately 40 were there.

The question of a fitting competition, rules and regulations, etc., in connection with this cup is being considered, and particulars will shortly be published in FLIGHT.

Mr. J. J. Holt opened the discussion in a very accomplished manner, his subject being on wire construction appertaining to model aircraft.

Mr. D. A. Pavely followed by giving some excellent advice on the construction of compressed-air models, after whom Mr. T. Newell submitted some most valuable advice and hints on the construction and flying of fuselage models.

Mr. C. J. Burchell, who, unfortunately, was confined to a very short space of time, gave some most interesting information regarding model aeroplane construction generally.

A hearty vote of thanks was passed to the above named for their generous information and assistance to all. The evening terminated by a vote of thanks to the chairman.

It is hoped that the T.M.A.C. will be well represented on Wimbledon Common on Saturday next, March 29 (Gamage Cup Competition). All members should also make a special effort to be at the same meeting place on the following Saturday, April 5, to compete for prizes to be distributed after the meeting. A. E. Jones, Hon. Secretary, 48, Narcissus Road, West Hampstead, N.W.6. 'Phone : Hampstead 8363.

Harrogate Aircraft Club (Model Section)

THE model section of the Harrogate Aircraft Club send us the following information, which, incidentally, indicates that "airmindedness" wants developing pretty badly in certain quarters :—

The Harrogate Town Council has refused permission for the Model Competition arranged for April 5, on the Stray, "on account of danger to children and others," and a notice stating that a portion of the Stray was set apart for aviation has hastily been altered, although it has probably been there since 1911. The Y.M.C.A. has, however, come forward with an offer of their ground *behind West End Avenue, Harrogate*, where the competition will be held. The previous announcement in FLIGHT regarding this competition is bringing in entries and enquiries from places as far apart as Newcastle, London, York, Bradford, etc.

CORRESPONDENCE

[*The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.*]

AIR ACCIDENTS

[2293] "N.D.N." in his letter (2290), referring to my proposition of detachable petrol-tanks, remarks that "it would be extremely dangerous to people on the ground." He rather misses the point of my suggestion. Obviously, in a forced landing over houses, the situation is already so disastrous that the question of detachment or no detachment hardly comes into the picture. But in point of fact—most forced landings are not of this nature. They take place over fields and in unpopulated country—witness the Christmas Eve fatality of 1924 on Castle Hill, Purley, the Air Union machine at Marden recently, and many others where fire has resulted in increased loss of life. It is in such emergencies—constituting the large majority of forced landings—that the getting rid of the presence of a large store of petrol and thus eliminating the possibility of fire would be of such immense advantage.

I am afraid the suggestion of attaching parachutes to the tanks would be impractical, owing to the large size of the parachute and the probable low altitude of the machine.

G. D. EVERINGTON.

Sanderstead, Surrey.
March 24, 1930.

AIR TRANSPORT IN THE WEST INDIES

[2294] During a recent cruise in the West Indies I was much struck with the possibility of developing air transport by means of sea-planes travelling between the Islands and different points of the same Island.

Distances are comparatively short, weather conditions during a considerable portion of the year are favourable, and there are a number of well-to-do people on many of the Islands. There are, thus, the necessary elements for successful air transport, which would result in considerable orders for 'planes.

I am convinced that this development is inevitable, and there is no reason why British firms should not reap great benefit from it. If they are to do so, however, there must be no delay or we shall be forestalled by the Americans, who already have services between Florida and Cuba and Florida and the Bahamas, as well as services across the Isthmus of Panama.

It is remarkable that almost all the motor cars in the Islands are American, and if we are not careful Americans will also obtain a monopoly of air transport. It seems to me that there is here an opportunity for our manufacturers, who, besides manufacturing machines, must be prepared to run the services either directly or indirectly through subsidiary companies controlled by them.

J. W. MADELEY.

Burnham, Bucks.,
March 18, 1930.

PHOTOGRAPHS OF THE "MOTH VI"

[2295] Concerning the reference to the photographs appearing on page 336 of your issue of March 21 under the above heading, we find on investigation that two photographs (Nos. 1 and 3 enclosed herewith) are definitely ours, but it is possible that the centre one of those which were published on page 291 of your March 14 issue emanated from 175, Piccadilly. Our version of this is enclosed, and you will find on examination, that there is a general similarity to the *Aeroplane* photograph you published. We trust this oversight on our part has caused you no serious inconvenience.

Short Brothers (Rochester and Bedford), Ltd.,
(Signed) J. WOOD, Secretary.

Rochester, March 24, 1930.

[It is evident from the photographs sent us by Short Brothers that their "diagnosis" is correct, so that only the centre photograph on page 291 should have been acknowledged to our contemporary, and not all three.—ED.]

Death of Mrs. Sopwith

IT is with extreme regret that we have to record this week the death, on March 24, at 32, Green Street, London, W.1, of Mrs. Sopwith, wife of Mr. T. O. M. Sopwith, C.B.E. Mrs. Sopwith was taken suddenly ill whilst on holiday in the South of France, and died within ten days of her return to England. Mr. Sopwith, who was in India when his wife was taken ill, rushed home with all possible speed, but did not arrive back in time. The funeral service was held at St. Mark's, North Audley Street, on March 27, and the burial took place at East Horsley. The Hon. Mrs. Sopwith was the daughter of the late Lord Ruthven, and sister of the present peer. She was married to Mr. Sopwith in 1914. The sincere sympathy of all who know him will go out to Mr. Sopwith in his great bereavement.

International Touring Competition

ENTRIES for the International Touring Competition, July 20-August 7, close on April 15, 1930. Late entries at double entry fee will be received up to May 15, 1930. All enquiries concerning British competitors should be addressed to the Secretary, Royal Aero Club, 3, Clifford Street, W.1.

In Editorial Comment in our issue of February 28 we raised certain queries concerning the interpretation of the regulations governing the award of points in the speed test, and take-off and alighting tests of the International Touring Competition which is to be held from July 20 to August 7, starting and finishing at Berlin. In the March 7 issue we published a likely interpretation of the system on which the award of points is to be made, and we have now had, from the Royal Aero Club, confirmation that the interpretation of the rules is as we surmised in our March 7 issue. The Royal Aero Club has forwarded the query to the Aero-Club von Deutschland, whose vice-president, Herr G. von Hoeppner, has very kindly confirmed the correctness of FLIGHT's interpretation of the regulations. Readers who desire to know exactly how the award of points will be made are therefore referred to page 286 of our March 7, 1930, issue.

"Into the Blue" in Scotland

CAPTAIN NORMAN MACMILLAN's book "Into the Blue" is at present appearing in serial form in *The Glasgow Evening News*.

The Handley Page "Clive"

BY a printer's error in the caption to the photograph of the new Handley Page Troop Carrier "Clive," which appeared in last week's issue on page 332, the name of the machine was erroneously given as "Olive." The mistake was actually discovered by the Editorial Staff and the correction made, but our printers failed to carry it out. We regret the mistake.

Royal Canadian Air Force

THE Department of National Defence, Ottawa, has ordered five Vancouver flying-boats from Canadian Vickers, Ltd., to replace obsolete aircraft used by the Royal Canadian Air Force on forest fire patrol. The total cost is stated to be about $350,000. The Vancouver was described in FLIGHT, of November 22, 1929. It has a metal hull, and is intended to carry parties of fire fighters to the neighbourhood of a forest fire. The five boats ordered are to be of the cabin type and will carry a crew of three and seven passengers. As it must be able to work on small lakes, the Vancouver has been designed for low landing speed, quick take-off, and high initial rate of climb. The five machines in question are to have two 325 h.p. engines each, but the type of engine is not stated.

45 Squadron Dinner

THE wartime members of 45 Squadron R.F.C. and R.A.F. have held a re-union dinner during the last four consecutive years. Organised by a dinner committee formed of non-commissioned members of the old squadron, the dinner serves excellently to keep old members in touch with each other, and as many as possible of the officers who served with the squadron during the war make a point of attending the dinner and meet the men who served them so well during the years 1916-19. It might be added that any surplus funds which may be left over from the dinner are devoted to assisting any old member of the squadron who may have fallen upon evil times. This year's dinner, the fifth, will be held at the Crown and Cushion Restaurant, London Wall, London, E.C., at 6.30 p.m., on April 26. All members of the squadron who wish to attend are requested to communicate with Mr. B. Wetherall, 28, Gladstone Road, Buckhurst Hill, Essex.

INTER-SERVICES RUGBY FOOTBALL

R.A.F. *versus* Army

THE Army beat the Royal Air Force at Twickenham on Saturday, March 22, by 1 goal and 3 tries (14 points), to 1 goal and 1 try (8 points). This was the last match of the Services Tournament, and the Army are champion service for the year. The result was not unexpected. H.R.H. Prince Arthur of Connaught watched the match.

As the Navy had already beaten the R.A.F., and the Army had beaten the Navy, it was only to be expected that the Army would also beat the R.A.F. The expected does not always happen in Rugby, but on this occasion the Army team was of a higher calibre than the air force XV, and a reversal of expectations would have been too much to hope for. But the way in which the play went was rather surprising. On last Saturday, the R.A.F. team was stronger than the one which put up a very creditable game against the Navy, but it did not put up so good a show of football. Flt.-Lieut. G. R. Beamish was back to lead the pack and captain the team. Pilot Officer Cotton moved into left centre, his proper place, while the presence of the two Whites on the wing strengthened the Air Force attack. Pilot Officer Elsmie took the scrums instead of Sqdn.-Ldr. Russell, and filled the place very capably. At the last moment, Flying Officer Constantine had to scratch, and his place in the scrum was taken by Flying Officer Beaumont.

The Army had two English internationals playing, 2nd Lieut. Novis at right centre, and 2nd Lieut. Rew in the scrum; while the full back, 2nd Lieut. Hunt, has played for Ireland. Sir T. Devitt was not ably to play.

One of the great features of the game between the R.A.F. and the Navy was the sound tackling on both sides. Last Saturday, one of the causes of the downfall of the Air Force was that the tackling was not quite good enough. The defenders seemed on many occasions to misjudge the pace of the Army runners. They went for them, and they often checked them, but too often it was only by getting one hand round an ankle, which enabled the runner to wriggle partly free and hand on the ball to someone else. At other times, the high tackle was attempted, doubtless in the hope of smothering, and, as so often happens when these tactics are followed, the Army man would wriggle his head clear and proceed on his way. One of the greatest tacklers of all time was H. B. Tristram, full back for Loretto School, Oxford, and England. He once wrote the following triolet of advice to full backs, but it can be applied also to three-quarters (I quote from memory):—

"If only you'll go with a rush for his middle
You'll tackle him low.
Never mind if you're slow,
If only you'll go.
For the runner you'll diddle,
If only you'll go with a rush for his middle."

The Air Force did not always do that last Saturday, and this failing contributed not a little to their downfall. Another thing seemed to affect their play in the early stages of the game, though they are not the only team which I have seen suffer in this way. It was a very dry and hot day, with not a trace of damp to take the shine off the new ball. One could see the sun shining on the surface of the leather. The Air Force three-quarters found it slippery, and dropped not a few passes. After the forwards had hacked the ball about a bit, it became easier to hold. The Army outsides were not affected in the same way.

It was, in fact, at three-quarters that the Army won and the R.A.F. lost. The latter did not make at all a bad line, and they carried out a number of movements in very good style indeed. But in the general average of their play, both in attack and in defence, they were a less experienced and less polished line than the Army quartette. The two packs of forwards were very evenly matched, and each side got the ball in the scrums about as often as the other did. The Army heeling was a bit quicker and cleaner, which enabled their halves to make better openings. The honours, however, must go to the R.A.F. pack, for Kirby was taken out of the scrum, and even so the seven men held their own. At half-back, too, there was not very much to choose between the two teams. Elsmie did well, and Odbert frequently showed his international form. The two full backs were also very good. Each made one mistake, but on the whole both were sound and cool. Hunt showed more capacity for turning defence into attack, and once looked rather like scoring himself. But Ievers played really well, and his kicks to touch were frequently applauded.

One excellent feature of the game was that the R.A.F. never got their tails down when points were scored against them. Though their three-quarters line was outplayed, it never lost heart, and was never afraid to attack. There was always the possibility of a score when Odbert set them moving. Cotton in the centre did a lot of useful work, and G. R. White on the right wing looked as if he might have shaken the Army defence up if he had had more openings made for him. On the whole it was an exhilarating match to watch.

The Course of the Game

For the first quarter of an hour the play was rather featureless, until a free kick to the Air Force gave a chance for a penalty goal, and the attempt was quite a creditable one. Then the Army three-quarters got going, and their right wing was only just stopped by Ievers in time. The Army pressed, and Hunt tried a drop at goal, without success. But pressure increased, and the Army outsides made a very good movement in which several men took their passes like books, and it ended by Rice-Evans jumping over the last defender and scoring. The kick at goal failed.

The Air Force attacked for a while, and Cotton kicked to touch well in the Army 25. But the Army broke away again, and another excellent passing movement, in which the Air Force tackling was far from clean, ended in Cole scoring right behind. This time Nott made no mistake with the kick, and the Army were eight points to the good.

After 25 minutes' play, the Air Force were given another free kick within range, and Williams put the ball just to the right of the posts. N. E. White fly-kicked and followed up right on to Hunt. The Air Force pressed, and Cotton tried to drop a goal, but did not get hold of the ball properly with his foot. Then Hunt fumbled, and was tackled with the ball. Odbert went through most of the defence, but sound tackling saved the Army lines. For a few minutes the play went to and fro from one end of the field to another, and then the Air Force, headed by George Beamish, made a rush of forwards and outsides together at a tremendous pace. The ball went over the line, and Aircraftman Gibbs, following up hard, just got the touch down after a most exciting race. Cotton failed with the kick.

The Army had a spell of attacking, and for a while the Air Force forwards seemed to tire, for they did not get round quickly enough. Half-time brought them welcome relief, and they cannot have been sorry when the band prolonged the interval by marching and playing round the ground. Half-time score: Army, 8; R.A.F. 3.

The second half began with the Air Force on the attack. G. R. White had two very good runs, the first along the touch line, and the second through the centre. The last looked as if it might end in a try, but instead it ended in a forward pass. Then Sergt. Kirby, who was at this time playing with a roving commission behind the three-quarter line, had a run and kicked ahead, but Hunt made a mark and cleared. The Air Force continued to attack, first up the left wing, and then again through G. R. White. But suddenly the position was reversed. Novis broke through the Air Force defence, where again the scrappy nature of the tackling was very apparent, and when he could get no further he passed to Townend, who scored the third Army try. The kick at goal failed.

The Army pressure continued for a bit, but not for long. Odbert relieved with a good run through the centre, and then Pott got a pass when in a promising position. Instead of working with his wing man, he elected to run in to the centre, where the red line of Army jerseys was not thin but thick, and so he soon was overwhelmed. Then a couple of free kicks to the Army, and Ievers' one fumble of a catch, let the Army back, and for the next 10 minutes, the play remained about midfield. Then suddenly the Air Force became brilliant. A passing movement started which beat the defence all along the line. Cotton and Pott both did fine work in the course of it, and at the end N. E. White went over for a very fine try, right behind. Gibbs kicked the goal, and the scores now were: Army, 11; R.A.F., 8.

Things began to look brighter for the Air Force, for the forwards were now more than holding their own even without the help of Kirby. But five minutes later, McCreight made an opening and sent Wainwright over in the corner. The kick failed. Then the ball went to Hunt who ran finely up the right wing and set the Army three-quarters going. Elsmie almost cleared by getting smartly away from the scrum, but he was alone, and was soon smothered. The last incident

in the match worth recording was a good run by Pott and N. E. White. But the Army defence held, and the whistle went with the score: Army, 14; R.A.F., 8.

F. A. DE V. R.

The teams were :—

R.A.F.—P./O. G. M. Ievers (No. 2 F.T.S., Digby); P./O. G. R. White (No. 2 F.T.S.); F./O. J. R. H. Pott (No. 3 F.T.S., Grantham), P./O. R. D. Cotton (No. 19 F.S., Duxford); P./O. N. E. White (C.F.S.); F./Lt. R. V. M. Odbert (Andover); P./O. G. R. A. Elsmie (No. 43 F.S., Tangmere); F./Lt. G. R. Beamish (Capt.) (Henlow); P./O. W. V. M. McKechnie (Calshot); Sergt. W. H. Kirby (Halton); P./O. G. E. S. Williams (No. 2 F.T.S.); F./O. J. Beaumont (No. 4 A.C.S., Farnborough); Sergt. A. C. Hall (Wittering); A./C. D. R. Gibbs (Sealand); P./O. R. L. Wallace (No. 17 F.S., Upavon).

Army.—2nd Lieut. E. W. F. de V. Hunt (R.A.); Lieut. G. Peddie (R.A.); 2nd Lieut. J. A. M. Rice-Evans (Royal Welch Fusiliers); 2nd Lieut. A. L. Novis (Leicestershire Regt.); 2nd Lieut J. W. Wainwright (R.A.); 2nd Lieut. J. R. Cole (Loyal Regt.); 2nd Lieut. C. C. McCreight (R.A.); Corporal G. Townend (Duke of Wellington's Regt.); Lieut. H. H. C. Withers (R.E.); Lieut H. Rew (Royal Tank Corps); Capt. C. H. B. Rodham (Indian Army); 2nd Lieut. R. G. S. Hobbs (R.A.); 2nd Lieut. D. H. Nott (Worcestershire Regt.); 2nd Lieut. K. J. MacIntyre (Royal Tank Corps), Sergt. W. A. Morton (K. O. Royal Regt.).

THE ROYAL AIR FORCE

London Gazette, March 18, 1930.

Group-Capt. H. Cooper, D.S.O., M.R.C.S., L.R.C.P., is appointed an Honorary Surgeon to the King (March 6).

Air Vice-Marshal D. Munro, C.B., C.I.E., M.B., Ch.B., F.R.C.S. (E), relinquishes his appointment as Honorary Surgeon to the King on retirement from Royal Air Force (March 1).

General Duties Branch

The follg. are granted permanent commns., as Pilot Officers, with effect from March 8, and with seniority of the dates stated :—G. D. Emms (Sept. 8, 1928); L. A. Hutchings (March 8, 1929). J. Constable-Roberts is granted a short service commn. as Flying Officer with effect from and with seniority of March 3. The follg. Pilot Officers on probation are confirmed in rank :—R. I. Johnson (March 1); A. C. P. Westhorpe (March 15). The follg. Pilot Officers are promoted to rank of Flying Officer :—G. N. E. Tindal-Carill-Worsley, J. J. Owen (Jan. 28); D. A. Craik, E. B. Grace (Feb. 24). Flight-Lieut. S. Nixon, O.B.E., is seconded for duty as Assistant Director (Organisation), Royal Airship Works, Cardington (Jan. 1). The follg. Flying Officers are transferred to Reserve. Class A (March 14) :—J. H. Barringer, S. C. Parker.

The follg. Flying Officers relinquish their short service commns. on transfer to Indian Army (Feb. 25) :—C. J. Veevers, W. R. J. Spittle. The follg. Flying Officers relinquish their short service commns. on account of ill-health :—P. G. S. Gardiner (March 12); C. Heard-White (March 14); J. W. M. Nancarrow (March 14). The follg. Flight Lieutenants relinquish their short service commns. on completion of service (March 15) :—A. R. Prendergast, V. J. Somerset-Thomas, H. G. Kirkman, R. Stiven.

Accountant Branch

Flight-Lieut. H. J. Gilbert is placed on retired list (March 14).

Medical Branch

Flight-Lieut. J. F. McGovern, M.B., B.Ch., is granted a permanent commn. in this rank (March 19).

Memorandum

The permission granted to Second-Lieut. H. J. Dick to retain his rank is withdrawn on his enlistment in the Supplementary Reserve (Feb. 25).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Pilot Officers on probation are confirmed in rank :—G. S. Ogilvie (March 9); T. B. Cooper (March 14); G. A. G. Bowden (March 18).

The follg. relinquish their commissions on completion of service :—Flying Officer L. W. Thres (June 24, 1929); Flying Officer G. R. Burge (Feb. 10); Flying Officer W. J. Walsh (Feb. 26); Pilot Officer E. F. S. Hughes (Jan. 27). Flying Officer P. B. Clews relinquishes his commn. on account of ill-health, and is permitted to retain his rank (March 19); Flying Offioer J. Constable-Roberts relinquishes his commn. on appointment to a short-service commn. in R.A.F. (March 3).

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—The follg. Pilot Officer to be Honorary Flying Officer.—P. Du Cane (March 6).

No. 603 (CITY OF EDINBURGH) (BOMBER) SQUADRON.—The follg. Pilot Officers to be Flying Officers :—M. H. G. White (Dec. 25, 1929); J. E. Glenny (Jan. 11).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Wing Commanders.—G. W. Robarts, M.C., to R.A.F. Base, Gosport, for Administrative duties, 1.3.30. L. T. N. Gould, M.C., to Air Ministry (D.O.S.D.), for Air Staff (Signals) duties, 17.3.30. H. V. Champion de Crespigny, M.C., D.F.C., to No. 2 (Indian Wing) Station, to command, 25.1.30.

Wing Commanders: J. C. Russe'l, D.S.O., to H.Q., R.A.F., Transjordan and Palestine, for duty as Station Commandant, Amman; 7.3.30. J. K. Wells, A.F.C., to R.A.F. Practice Camp, Catfoss, to command; 8.3.30.

Squadron Leaders.—C. R. Cox, A.F.C., to No. 6 Squadron, Middle East, 21.2.30. V. R. Gibbs, D.S.C., to Armoured Car Wing, Iraq, 21.1.30. T. Q. Studd, D.F.C., to No. 23 Group H.Q., Grantham, 2.3.30. A. McR. Moffatt, to Station H.Q., Manston, 1.3.30. H. J. Roach, A.F.C., to No. 10 Group H.Q., Lee-on-Solent, 26.2.30.

Squadron Leaders: T. E. Salt, A.F.C., to R.A.F. Depot, Uxbridge; 8.2.30. G. H. Martingell, A.F.C., to No. 15 Sqdn., Martlesham Heath; 1.3.30. F. W. Trott, M.C., to No. 27 Sqdn., India; 7.3.30. L. O. Brown, D.F.C., A.F.C., to No. 20 Sqdn., India; 7.3.30. G. B. A. Baker, M.C., to H.Q., R.A.F., Transjordan and Palestine; 25.2.30. D. W. Clappen, to No. 70 Sqdn., Iraq; 14.2.30. W. H. Dolphin, to R.A.F. Base, Malta; 28.2.30.

Flight-Lieutenants.—A. L. A. Perry-Keene, to H.Q., Wessex Bombing Area, Andover, 3.3.30. D. Drover, to R.A.F. Training Base, Leuchars, 3.3.30. W. N. Plenderleith, to No. 36 Sqdn., Donibristle, 10.3.30. A. J. Rankin, A.F.C., to No. 30 Sqdn., Iraq, 8.2.30. A. E. Lindon, M.B.E., to No. 4 Flying Training School, Middle East, 10.2.30. H. M. Groves, to Aircraft Depot, India, 2.2.30.

Flight Lieutenants: W. M. Fry, M.C., to No. 99 Sqdn.. Upper Heyford; 2.3.30. S. C. Strafford, D.F.C., to No. 6 Sqdn., Middle East; 1.3.30. L. F. Pendred, D.F.C., to H.Q., R.A.F., Transjordan and Palestine; 1.3.30. C. L. Falconer, to No. 1 Air Defence Group H.Q.; 6.3.30. F. W. Moxham, to No. 1 Flying Training Sch., Netheravon; 5.3.30. W. G. E. Hayman, to R.A.F. Depot, Aboukir; 1.3.30. H. H. Brookes, to H.Q., Iraq Command; 14.2.30. H. M. Massey, M.C., to Air Ministry (C.A.S.); 11.3.30. F. L. Hopps, A.F.C., to No. 99 Sqdn., Upper Heyford; 4.3.30. J. MacG. Fairweather, D.F.C., to Station H.Q., Kenley; 14.2.30. M. Wiblin, to No. 1 Air Defence Group H.Q.; 11.3.30. E. L. Ardley, to H.Q., R.A.F., India; 7.3.30. W. H. Poole, A.F.C., M.M., to H.Q., R.A.F., Transjordan and Palestine; 13.3.30. J. F. F. Pain, to No. 31 Sqdn., India; 7.3.30. J. G., Franks, to No. 2 (Indian Wing) Station, India; 7.3.30. L. G. Maxton, A.F.C., to No. 209 Sqdn., Mount Batten; 8.3.30. R. Pyne, D.F.C., Central Flying Sch., Wittering; 7.3.30. D. M. Fleming, to No. 22 Sqdn., Martlesham Heath; 10.3.30. L. G. Nixon, to No. 56 Sqdn., North Weald; 5.3.30. M. H. Ely, to No. 204 Sqdn., Mount Batten; 9.3.30. E. A. McKinley-Hay, to No. 3 Flying Training Sch., Grantham; 10.3.30. F. E. Nuttall, to No. 2 Flying Training Sch., Digby; 9.3.30.

Flying Officers.—P. A. Moritz, to No. 45 Sqdn., Middle East, 17.2.30. A. Maughan, to R.A.F. Depot, Uxbridge, 18.1.30. A. H. Montgomery, to R.A.F. Practice Camp, North Coates Fitties, 5.3.30. A. M. D. Howes, to R.A.F. Practice Camp, Sutton Bridge, 5.3.30. H. H. Leech, to Experimental Section, Royal Aircraft Estabt., S. Farnborough, 3.3.30. R. A. Whyte, to No. 7 Sqdn., Worthy Down, 3.3.30. J. McGuiness, to No. 35 Sqdn., Bircham Newton, 26.2.30.

Pilot Officers.—E. Esmonde, to No. 43 Sqdn., Tangmere, 3.3.30. W. N. H. Banks, to No. 216 Sqdn., Middle East, 6.2.30. S. J. H. Carr, to No. 55 Sqdn., Iraq, 7.2.30.

Pilot Officers: R. H. Cave Penney, to No. 70 Sqdn., Iraq; 14.2.30. D. H. V. Craig, to No. 26 Sqdn., Catterick; 6.3.30. J. A. Easton, to No. 31 Sqdn., India; 7.3.30. F. D. Lockwood, to No. 28 Sqdn., India; 7.3.30. P. B. Lusk, to Aircraft Depot, India; 2.2.30. G. D. Emms and L. A. Hutchings, both to No. 1 Flying Training Sch., Netheravon, on appointment to Permanent commns.; 8.3.30.

The undermentioned Pilot Officers are posted to No. 1 Flying Training Sch., Netheravon, with effect from 10.3.30 :—F. G. L. Bain, L. T. G. Barber, G. S. Barrett, J. H. Bell, W. J. Brighty, H G. Burgess, H T. Clark, R. C. H. Crosthwaite, H. I. Dabinett, E. S. Ennals, G. A. C. Foster, D. McC. Gordon, J. A. Hankins, P. G. Heaton, H. C. Hendrikz, M. H. Kelly, E. G. B. Kiddle, R. L. Kippenberger, C. A. M. Kyrke-Smith, Hon. F. D. H. Lea Smith, R. W. G. Love, J. G. Nolan, H. C. O'Loughlin, J. R. Palmer, M. P. Price, R. Ruston, R. C. Stuckes, J. H. Supple, M. S. Thompson, R. B. Wardman, and J. R. Watson.

NAVAL APPOINTMENTS

The following appointments were made by the Admiralty on March 15 :—

Lieut. (Flight-Lieut., R.A.F.).—R. G. Poole, to *Eagle*, April 14. *Lieut. (F/O., R.A.F.).*—N. T. Cowin, to *Furious*, April 14.

The following appointments were made by the Admiralty on March 20 :—

Lieutenants (Flying Officers, R.A.F.): A. R. C. Duvall, H. M. King and J. William Hale, to *Furious*; A. G. Poe, D. R. C. Hodson and S. W. D. Colls, to *Argus*; and J. H. Charsley and F. Somerville, to *Courageous*.

Sub-Lieutenant (Flying Officer, R.A.F.): J. A. D. Wroughton, to *Courageous*.

R.A.F. SPORT

Fencing

THE Army beat the R.A.F. in a fencing match at Aldershot on Wednesday, March 19, by 14 defeats to 22. The R.A.F. won the bayonet fights, but lost with the other three weapons, although Squadron Leader Sherriff, Amateur ex-Champion, won all his foil fights. The results were :—

Foil

THE ARMY.—Lieut. James, 1 defeat; R.S.M.I. Wyatt, 1 defeat; Q.M.S.I. Reid, 1 defeat. Total, 3.

R.A.F.—A.C. Hogg, 3 defeats; Corporal Turner, 3 defeats; Squadron Leader Sherriff, no defeat. Total, 6.

Epee

THE ARMY.—Lieut. Lane, 2 defeats; Lieut. Rippon, 1 defeat; C.S.M.I. Harris, 1 defeat. Total, 4.

R.A.F.—Flight-Lieut. Hardman, 2 defeats; Flight-Lieut. O'Donnell, 2 defeats; Sergeant Stubberfield, 1 defeat. Total, 5.

Sabre

THE ARMY.—Lieut. Saunders, 1 defeat; Q.M.S.I. Parsons, no defeat; A. N. Other, 1 defeat. Total, 2.

R.A.F.—Squadron Leader Sherriff, 3 defeats; Sergeant-Major Scott, 2 defeats; Sergeant Stubberfield, 2 defeats. Total, 7.

Bayonet

THE ARMY.—C.S.M.I. Gelder, 1 defeat; Sergeant Anderson, 2 defeats; Guardsman Fennessey, 2 defeats. Total, 5.

R.A.F.—Corporal Eyles, 2 defeats; Sergeant-Major Barber, 1 defeat; Flying Officer Wood, 1 defeat. Total, 4.

IN PARLIAMENT

R.A.F. and Civil Flying Meetings

Mr. Montague, on March 19, in reply to Mr. Day, said that pilots and aircraft of the Royal Air Force are to attend the meeting organised by the Leicestershire Aero Club at Desford aerodrome on April 19 next, and will probably be attending three other provincial meetings also, but definite arrangements for their participation in these have not yet been made. In no case are the men and machines at the disposal of the clubs; the flying is part of their Service training and *no* special remuneration is given for the duty, nor does any part of the profits, as such, go to the Royal Air Force. The organisers of the meetings are, however, called upon to refund all expenses incurred in excess of those of normal Service training, and the personnel participating receive allowances to cover expenses due to their absence from their ordinary station.

Fleet Aircraft Carrier and Buenos Aires Exhibition

Mr. D. G. Somerville, on March 20, asked the First Lord of the Admiralty if his attention has been drawn to the suggestion that one of the Fleet aircraft carriers should be sent to the Empire Exhibition at Buenos Aires next year to stimulate the sale of British aircraft in South America and generally to assist British participants in this exhibition; and whether he can make any statement in this connection?

Mr. Alexander: The answer to the first part of the question is in the affirmative, and I need hardly add that the object in view is one that I fully endorse. As regards the second part of the question, the matter is under consideration, but Fleet and training requirements and the heavy expenditure on fuel which would be involved present very real difficulties.

Defence Expenditure

Sir A. Knox asked the Under-Secretary of State for the Colonies what proportion of the sums expended during the years 1923-24 to 1929-30, under the heading Middle Eastern Services, Iraq and Palestine, Defence, have been payable in respect of Iraq to the Air Ministry, the Government of India, the War Office and other recipients, if any?

Dr. Shiels: I attach a statement showing the allocation of the sums expended during the years 1923-24 to 1929-30 under the heading "Defence, Iraq" of the Middle Eastern Services Vote.

Year		Total Amount Paid	Allocation: To Air Ministry For R.A.F.	To Air Ministry For other Services	To India	To War Office
		£	£	£	£	£
1923-4	..	5,033,790	3,575,984	31,396	957,175	469,235
1924-5	..	3,847,224	3,188,675	—	384,023	274,526
1925-6	..	3,314,813	2,712,359	871	331,875	269,708
1926-7	..	2,753,775	2,207,600	—	333,257	212,918
1927-8	..	1,648,038	1,392,000	—	221,482	34,556
1928-9	..	298,750	220,000	—	78,750	—
1929-30	..	227,000 (estimate)	223,000	—	4,000	—

R.Ae.S. and Inst.Ae.E.

Official Notice

On Thursday, April 3, Mon. P. Grimault will lecture before the Roya Aeronautical Society on "The Technical Organisation of the Compagnie Generale Aeropostale." In the course of his lecture M. Grimault will describe the aircraft, wireless, ground and oceanic organisation which has made possible the operation of one of the most difficult air routes in the world—that from Toulouse to Santiago. In the operation of this route the Compagnie Generale Aeropostale have been faced with every kind of air problem, from flying through sand storms, tropical rain storms and cloud, to crossing the Andes. How these problems have largely been solved will be explained by M. Grimault, and he will undoubtedly leave all those who hear the lecture with the impression that there is *no* airway in the world which could not be successfully operated when skill, organisation and tireless energy are behind it. The lecture will be at 6.30 p.m. in the Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi.

J. Laurence Pritchard, *Secretary*.

PERSONAL

Birth

On Wednesday, March 12, to Violet, wife of F. I. Bennett, of Kingston Hill and the H. G. Hawker Engineering Co., Ltd., a daughter.

Married

Flight-Lieut. J. M. Cohu, R.A.F., Peterhouse College, Cambridge, was married on March 22, at St. John's Church, Caterham Valley, to Barbara, only daughter of Mr. and Mrs. Bowly, Whyteleafe, Surrey.

On March 10, at the South Kensington Register Office, William Percy Wiltshire, R.A.F., eldest son of Mr. and Mrs. William Wiltshire, Sandrock, Farnham, Surrey, was married to Jean Summers Gourlay, second daughter of the late Robert Gourlay, of Kirkcaldy, Fifeshire, and of Mrs. Wessels, and step-daughter of Dr. J. J. Wessels Greytown, Natal, South Africa.

To be Married

The marriage arranged between Flight-Lieut. Eustace Jack Linton Hope, A.F.C., R.A.F., son of the late Maj. Linton Hope and Mrs. Hope, of Kingshotts, Fernhurst, Sussex, and Evelyn Hope, second daughter of Sir Arthur and Lady Balfour, of Ropes, Fernhurst, Sussex, and Riverdale Grange, Sheffield, will take place on Saturday, April 12, at St. John's Church, Ranmoor Sheffield, at 2.30 p.m.

Duckham's Adcol

Alexander Duckham & Co., Ltd., have a reputation second to none as manufacturers of lubricants. Their staff of highly skilled technologists has enabled them to keep pace with the intricate lubricating problems resulting on the rapid developments in aviation.

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Adcol Aero Oil N.P.5 complies with the Air Ministry's Specification, D.T.D. 104—P.4, and is recommended by De Havilland for their Gipsy Moth, by Cirrus Aero Engines, Ltd., for both the Cirrus and Hermes engines, and approved by Armstrong Siddeley. The same grade is used exclusively by the Brooklands School of Flying for their fleet of Moths, and the National Flying Services, Ltd., use and recommend it.

In July, 1929, Mr. A. C. M. Jackman, flying a Gipsy Moth and using Adcol, won the Challenge Cup for the Best Aggregate Performance at the Rotterdam International Meeting.

"Saro" Marine Aircraft

We have received from Saunders-Roe, Ltd., of Cowes, and Bush House, Aldwych, London, W.C.2, an exceptionally artistic catalogue concerning "Saro" Marine aircraft manufactured by them. It contains several illustrations of the "Cutty Sark" flying-boat, together with a detailed description, including a few notes on the general handling of this machine. It is well worth while obtaining a copy of this catalogue.

The Bristol Review

Almost every business house, now-a-days, runs its own journal, and the Bristol Aeroplane Co., of Filton, Bristol, are among those who believe in this form of propaganda. Their review, the first number of which has just been issued, is extremely well got up and most informative. The main idea will be that each issue shall contain matter of interest to the aircraft constructor and to all those responsible for the maintenance of Bristol Aero Engines, and if the following numbers fulfil the expectations awakened by this first issue, the demand for the *Review* should be large indeed. Anyone interested should write to the Publicity Department at the above address.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda. *No.* 1269 (*Ae.* 415).—Full Scale Maximum Lift Coefficient of R.A.F. 28 Section Wing. By E. T. Jones and K. W. Clark. June, 1929. Price 3*d.* net. *No.* 1270 (*Ae.* 416).—The Full Scale Determination of the Lateral Resistance Derivatives of the Bristol Fighter Aeroplane: Part III.—The Determination of the Rate of Roll Derivatives. By E. T. Jones. July, 1929. Price 9*d.* net. *No.* 1271 (*Ae.* 417).—Investigation of the Boundary Layers and the Drags of Two Streamline Bodies. By E. Ower and C. T. Hutton. September, 1929. Price 1*s.* 3*d.* net. *No.* 1272 (*Ae.* 418).—Wing Tunnel Tests with High Tip Speed Airscrews. Experimental Investigation of Blade Twist Under Load. By G. P. Douglas, W. G. A. Perring and R. A. Fairthorne. May, 1929. Price 6*d.* net. H.M. Stationery Office, Kingsway, London, W.C.2.

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1,689. F. de Benedetti. Propeller driving-gear in aircraft. (304,243.)
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